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Lolo National Forest

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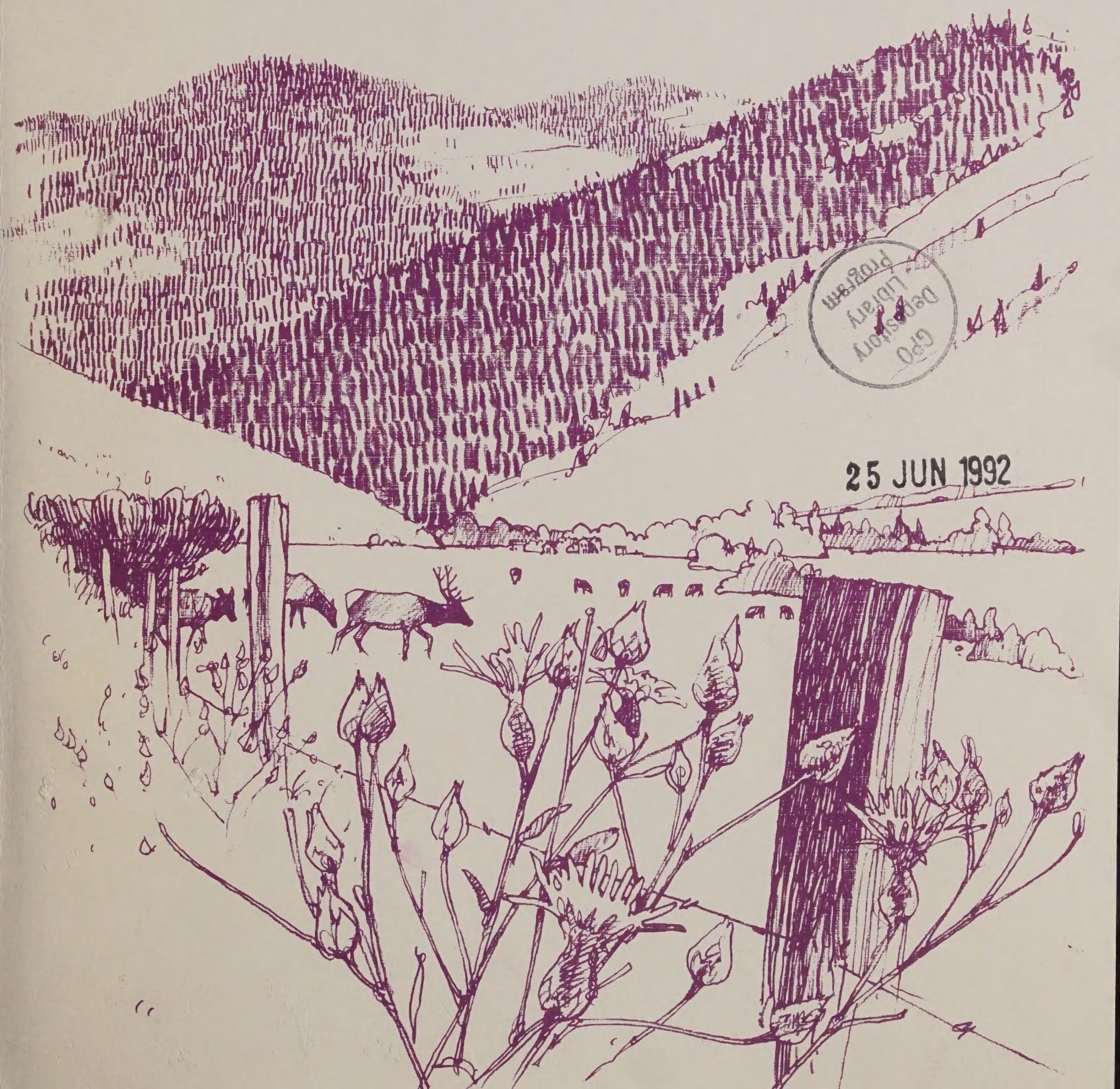
FINAL Environmental Impact Statement

Noxious Weed Management

Amendment to Lolo National Forest Plan



FINAL Environmental Impact Statemtent

Noxious Weed Management

Amendment to:
Lolo National Forest Land and Resource Management Plan (Forest Plan)

Missoula, Mineral, Sanders, Granite, Powell, Lewis and Clark,
Flathead, Ravalli, and Lake Counties,
Montana

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Abstract: This final environmental impact statement documents the analysis of five alternative noxious weed management programs for the Lolo National Forest. The selected alternative will amend the Lolo National Forest Land and Resource Management Plan, and will guide the planning and implementation of noxious weed management projects for the next decade or until the Forest Plan is revised. The alternatives are:

A no action — continue current direction; discourage establishment of new weed species while tolerating those weeds already present. Support biological controls, employ limited physical control and no chemicals.

B control weeds that affect adjacent landowners who have active weed management programs coordinated through a county weed board.

C ***Preferred Alternative*** — control weeds that affect national forest resources or adjacent landowners who have active weed management programs coordinated through a county weed board.

D control weeds that affect national forest resources or adjacent landowners who have active weed management programs coordinated through a county weed board, but do not use chemical herbicides.

E attempt to eradicate or suppress all noxious weeds on the forest.

In all alternatives, management objectives and treatment methods are set for nine weed species according to the ecology and status of each weed, and the effectiveness of available control methods. Management objectives range from tolerate to eradicate, with containment or suppression as intermediate control levels. Control methods include various biological, mechanical, and chemical tools.

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SUMMARY

SUMMARY

Introduction

This summary includes major findings, issues, and choice among the alternatives presented in the Final Environmental Impact Statement (FEIS) for Noxious Weed Management on the Lolo National Forest. The FEIS is a revised version of the draft EIS circulated in the spring of 1990. It includes additional information and changes made in response to public comment on the draft. The full FEIS is bound with this Summary.

Organization. There are seven major sections in this summary:

Purpose and Need

The primary purpose of this EIS is to provide the analysis necessary to develop a noxious weed management amendment to the 1986 ***Lolo National Forest Land and Resource Management Plan*** (Forest Plan). The Forest Plan noted that further research was needed to understand noxious weeds. The Plan EIS did not analyze the the environmental effects of noxious weeds nor of weed control. This EIS incorporates recent weed research and provides the missing environmental analysis. The selected alternative will include weed management objectives, weed prevention mitigation, and (if an action alternative is selected) weed control methods and mitigation **on a forest-wide, programmatic basis.**

Since this is a programmatic EIS, effects are estimated at forest-wide, upper-bound levels. The quantified effect levels in this EIS should be considered relative, not absolute. These numbers were conservatively estimated to provide a basis for comparison and choice among the alternatives. Worst-case assumptions are often used to project effects. Actual treatment levels for any alternative might be lower than projected due to budgetary constraints.

Any weed control project would require additional site-specific environmental analysis and documentation. Those project-level analyses could tier to this EIS to reduce redundant documentation of effects such as the human health effects presented in this EIS.

This FEIS analyzes the environmental impacts of five alternative noxious weed management programs. Alternative C is the Forest Serivice's preferred alternative. The proposed Forest Plan Amendment that would implement Alternative C is shown in Appendix I of this FEIS.

Issues

These 13 issues emerged during scoping for this EIS, and they guided the development of alternatives.

1. How are noxious weeds defined on the Lolo National Forest?

Federal law defines noxious weeds as plants of foreign origin that can directly or indirectly injure agriculture, navigation, fish or wildlife, or public health. The following nine species are established noxious weeds on the Lolo National Forest: spotted knapweed *(Centaurea maculosa)*, diffuse knapweed *(Centaurea diffusa)*, Canada thistle *(Cirsium arvense)*, musk thistle *(Cardus nutans)*, goatweed *(Hypericum perforatum)*, houndstongue *(Cynoglossum officinale)*, leafy spurge *(Euphorbia esula)*, tansy *(Tanacetum vulgare)*, and dalmatian toadflax *(Linaria dalmatica)*.

2. What and how significant are the impacts of noxious weeds on forest resources – including native vegetation; threatened, endangered, or sensitive plants and animals; soils; water quality; aesthetics; wildlife and fish; and domestic livestock?

See the Environmental Consequences section.

3. Under what circumstances will the forest take weed control action to protect National Forest resources? How will sites be prioritized for treatment?

Each alternative is structured around a basic management objective, which is translated into viable control objectives for each weed species. Treatment priorities are based on physical, biological, and administrative factors; and on risk assessments of weed spread and impact. Probability of successfully treating a given situation was also considered during priority development.

4. What management objectives can be identified for each noxious weed species that affects or may affect the forest?

As explained under the previous issue, these factors are evaluated in each alternative by individual species.

5. How can the forest work with other interested or affected parties – such as adjacent landowners, weed boards, government agencies, contractors, allotment permittees, or volunteer groups – to deal with shared aspects of the noxious weed situation?

This issue is addressed by including cooperative agreements with adjacent landowners as a minimum action alternative (B). Management standards which regulate the weed impacts of forest users are developed in Appendix D. State and local laws and regulations, as well county weed management plans, are discussed in the Purpose and Need chapter, and in Appendices A & B. In-service training and public information activities would vary according to the objectives of each alternative.

6. How can road construction, travel management, recreation management, range management, and other forest activities be adjusted to control the spread of noxious weeds?

Management requirements for minimizing or preventing noxious weed spread are developed in Appendix D. Many of these management standards are already being applied, and are included in all alternatives.

7. How would the weed management methods proposed in each alternative – including preventive, mechanical, biological, manual, and chemical methods – affect human health and the natural environment?

The Environmental Consequences chapter covers this issue, drawing on details in Appendix G. The effects of the various alternatives are compared in the Alternatives chapter. Mitigation is discussed in both chapters. See Appendix C for the Monitoring Plan, and Appendix D for management standards.

8. How can the forest cost-effectively manage noxious weeds under various budget constraints?

Comparative costs of control methods, along with expectations of success, were considered when matching the permitted control tools for each species to the general objective for each species. Overall cost of each alternative is compared to historic budget levels, as well as to the other alternatives. See the Alternatives chapter for the comparison, and the Environmental Consequences chapter for the economic details for each alternative.

9. How will the forest collect data on the extent and spread of noxious weeds; how will it monitor the effects of weed management activities?

These elements are included in the monitoring plan found in Appendix C.

10. When chemical herbicides are considered viable control tools, which chemicals will be used?

The Alternatives chapter discusses the selection of the most appropriate chemicals for given weed species and control objectives. Herbicide use is further limited by site factors as noted after the next issue.

11. How would chemical use be restricted; how would chemical accidents be handled?

Chemical use considered in this EIS ranges from no herbicide application under alternatives A and D, through varying levels of application in the other alternatives. Aerial application of herbicides was eliminated from detailed study. See the Alternatives and Environmental Consequences chapters for further discussion.

Appendix D lists the management requirements that restrict where and under what conditions herbicide application would be allowed under any alternative. Each project would have a site-specific emergency spill plan, developed according to the guidelines in Appendix E.

12. How would sites be revegetated after noxious weed control actions?

Management requirements include consideration of revegetation needs during project planning (Appendix D). Monitoring after control actions will include revegetation status and trend (Appendix C).

13. How can the forest support research into biological and other alternative weed control methods; how will noxious weed training and new information be disseminated to Forest Service employees, permittees, and contractors?

The Lolo can provide study sites to researchers working on biological or other new control methods. Funding of research activities varies among the alternatives considered. The forest will remain open to research proposals under all alternatives. Each proposal would be analyzed separately for environmental impacts.

As noted in the Alternatives chapter, training levels vary between alternatives according to the weed management goals for each alternative.

Affected Environment

The Lolo National Forest stretches for 120 miles in west-central Montana, from the Continental Divide to the Idaho border. Width varies from 40 to 80 miles. The Clark Fork of the Columbia River is the major drainage. Interstate 90 bisects the forest. The exterior boundary of the Lolo lies in nine different Montana counties (Flathead, Granite, Lake, Lewis and Clark, Mineral, Missoula, Powell, Ravalli, and Sanders). The Lolo also shares a common boundary with a Montana county (Lincoln), and with three Idaho counties (Clearwater, Idaho, and Shoshone). The forest administers about 2.1 million acres inside this exterior boundary. Actual land ownership within the forest boundary is checkerboard and intermingled with many other landowners.

Topography and Vegetation. The Lolo lies in the Northern Rocky Mountains, which are characterized by north-to-south oriented ranges separated by flat valley bottoms and foothill benches and terraces. Terrain is highly dissected, steep, and rugged. Mountains are often higher than 7,000 feet and show the effects of alpine glaciation. While midslopes are generally steep (slope greater than 50 percent), gentle slopes are often found near larger streams and some ridgetops. Most of the land is heavily timbered with conifers, but many south-facing slopes are grassy, open, and park-like. There are no known Threatened or Endangered plants on the Lolo. Eight known and 15 suspected Sensitive plants are listed for the Lolo.

Precipitation and Climate. Atmospheric conditions are modified by aspect and slope, and become progressively cooler and more moist as elevation increases. Climatic zones range from the semiarid and relatively warm valley bottoms through a broad range of cool, moist coniferous forests to the cold, moist subalpine and alpine mountain tops. The average annual precipitation for the forest is 42 inches, two thirds of which falls as snow. In valley bottoms along the Clark Fork, average annual precipitation is closer to 14 inches. The area is affected by both Pacific Maritime and Continental weather systems.

Noxious Weeds. Weeds can have effects in two different situations. The first situation involves plant ecology. The second situation includes non-ecological issues.

Ecological Risk: A plant species generally has a range of environmental conditions under which it may out-compete other species (crowding out other plants), Outside this range, it may survive at low levels that have little to no effect on other plants. In this ecology-based situation, only habitat types

where weeds significantly crowd-out other plants would be considered at risk for weed effects.

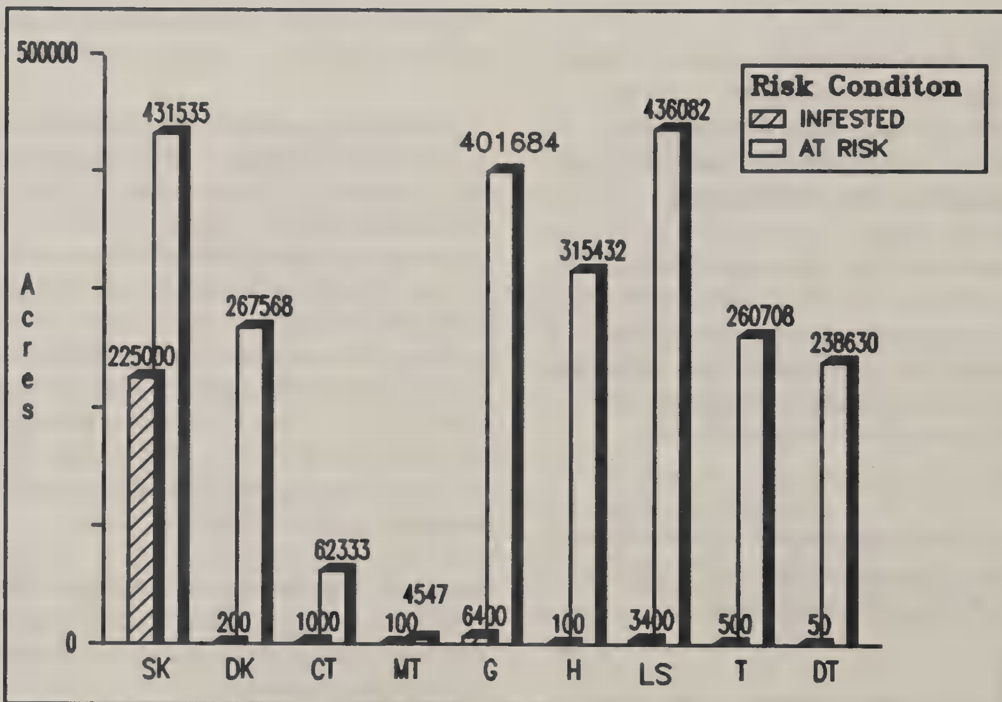
Non-Ecological Risk: In the second situation, the mere presence of a weed plant could have an effect independent of the weed's ecological impact on other nearby vegetation. An example would be individual, scattered plants along a roadside, in a habitat where the weed can survive but not dominate other plants. If this road leads to other habitat types that could be ecologically impacted by the weed, then these scattered plants could serve as a source for weed spread into those areas. Another example would be scattered plants in a research natural area or wilderness, where the presence of non-native vegetation could be seen by some as a negative effect, even if other plants are not crowded out.

Our forest ecologist has developed a weed risk rating (high, moderate, low, or none) for each weed species and each habitat type on the forest. That risk rating indicates that as much as ⅓ of the Lolo National Forest may be at long-term ecological risk to weeds. This includes the drier, more open habitat types.

Noxious weeds have not been systematically mapped or inventoried on the Lolo. The best available estimates of current infestation levels and spread rates are shown below.

Spotted knapweed is the only species that is approaching its potential risk coverage. At about 225,000 acres, it is in a separate class from the other weeds which range from 50 to 6,400 acres.

While ⅔ of the Lolo National Forest is not at risk to weed infestation, eleven percent of the forest is occupied by spotted knapweed. Spotted knapweed already occupies over half of the area at risk. All other weeds appear to be at relatively early stages in their invasion of the forest.



Current Infestation and Area at Risk for Each Weed

Current Infestation and Spread Rate Estimates by Weed Species

WEED SPECIES	1988 INFESTED ACRES[1]	10-YEAR SPREAD RATE
Spotted knapweed	225,000	3%
Diffuse knapweed	200	25%
Canada thistle	1,000	30%
Musk thistle	100	2%
Goatweed	6,400	25%
Houndstongue	100	40%
Leafy spurge	3,400	100%
Tansy	500	30%
Dalmatian toadflax	50	150%
TOTAL INFESTED	236,750	

[1]"Infested Acres" are those where the weed dominates or threatens to dominate native vegetation (moderate or high ecological risk).

Social and Economic Setting. Public interest in weeds varies depending on how individuals perceive noxious weeds affect them. Agricultural interests are concerned about reduced crops or forage. Other residents are concerned about the potential consequences of herbicides on human health and well-being. Some are concerned about displacement of native vegetation and reduced forage for big game such as elk and deer.

Missoula, Mineral, and Sanders are the main counties in which the Lolo National Forest lies. The city of Missoula is a trade center for western Montana, and at 33,388, it is the largest city in the area (1980 census). In the 1980 census, Missoula County population was 76,016; Sanders County 8,675; and Mineral County 3,675. The population in these counties is 95 to 98 percent white.

Forest products form the largest component of the western Montana economic base. For the three county area (Missoula, Mineral and Sanders) that makes up the major market area of the Lolo National Forest, less than one percent of wage and salary employment comes from the Farm Sector, of which livestock is one component. Thus livestock forage from the National Forest is not of significant importance to the local economy in total. However, livestock forage is very important to some individual users. Though it is not a major forest activity, livestock grazing on the Lolo National Forest does furnish part-time livelihood for several permittees. Other rural, agriculture-based lifestyles, such as horse owners and hay or grain growers, may be affected by noxious weeds.

Natural resource amenity values attract people to this region, even when employment opportunities are limited. Earnings are significantly lower here, compared with other parts of the country, reflecting a "quality of life" premium that people are willing to pay to live here. Hunting, fishing, outdoor recreation, mushroom and berry gathering are all amenities that are part of this quality of life premium.

Some people who use these outdoor amenities place high value on "naturalness," and oppose extensive use of chemicals or other intrusive management practices. Some gather wild food to reduce their intake of pesticides found in commercial foodstuffs. This natural lifestyle takes on a spiritual aspect for some, including Native Americans.

Many Native Americans practice religious and spiritual ceremonies on lands administered by the Lolo National Forest. These include such activities as vision quests, gathering traditional foods, and hunting.

The fiscal year 1989 budget for the Lolo National Forest was $14,000,000 to $16,000,000; the range program portion was about $125,000 (0.8 to 0.9 percent). Total fiscal year 1988 receipts were $2,861,000, 25 percent of which was paid to the State of Montana. The grazing portion of those receipts was less than $9,000 (0.3 percent).

Affected Resources.

The following resources and programs can affect the presence or spread of weeds, or could affect or be affected by weed control methods.

Recreation. The Lolo National Forest offers a wide variety of land, water, wilderness, and winter based recreation. Hunting, fishing, hiking, and wildlife viewing opportunities are abundant. Recreation facilities on the Lolo can be thought of as either "dispersed" recreation or "developed sites." Developed sites include ski areas, campgrounds, and visitor centers. Dispersed recreation includes hiking, ORV use, driving for pleasure, hunting, and camping outside a designated campground. In 1988 the Lolo reported 267,600 Recreation Visitor Days (RVD, one person spending 12 hours) in developed sites. Dispersed recreation use was 1,299,100 RVDs in non-Wilderness areas.

Cultural. The Lolo has many cultural sites, both prehistoric and historic. Prehistoric sites include the remains of camp sites, rock art or other identifiable activity areas. Generally, these sites were occupied from the last 250 years to nearly 6,000 years ago. Historic sites include Fort Fizzle, the Lolo Trail, homesteads, mines, the Ninemile Remount Depot, and other old ranger stations and lookouts.

Wilderness. There are 142,052 acres of designated Wilderness on the Lolo National Forest. This includes Rattlesnake, Welcome Creek, and portions of the Scapegoat and Selway-Bitterroot. The Lolo Forest Plan recommends an additional 223,600 acres for Wilderness designation by Congress. A wilderness bill is still pending for Montana. The Lolo reported 8,700 Recreation Visitor Days of Wilderness use in 1988.

Visual. All lands on the Lolo National Forest are visible to varying extents by the viewing public. Primary travel corridors, including state and federal highways, major forest roads, and major forest trails have been assigned a visual quality objective of Retention for their foregrounds *(Retention is a visual quality objective which in general means human activities are not evident to the casual forest visitor)*. Communities, campgrounds, lakes, and rivers often have the same Retention visual quality objective. These foreground landscapes are often at higher risk to noxious weeds because of the existing ground disturbance and the introduction of weeds by vehicles, people, and stock along these corridors or activity centers.

Wildlife. Wildlife habitats are extremely varied on the Lolo, ranging from low elevation openings dominated by bunchgrass to alpine tundra. The Lolo provides habitat for in excess of 300 vertebrate wildlife species. Included are nine species of big game such as moose, elk, and mountain goats; over 40 snag-dependent species such as woodpeckers and flying squirrels; and numerous songbirds, small mammals, reptiles and amphibians. Four species are listed as Endangered or Threatened: the grizzly bear, gray wolf, peregrine falcon, and bald eagle. Sensitive species include the loon, boreal owl, western big-eared bat, harlequin duck, and Coeur d' Alene salamander.

Aquatic Habitat and Fisheries. The aquatic and riparian resources of the Lolo National Forest include a diverse range of streams, lakes, wetlands, and flood plains. Fishable populations are found in about 3,500 miles of stream and 96 lakes (5,220 acres). The forest also has other lakes, streams, and marshes that provide habitat for an abundance of both vertebrate and invertebrate lifeforms. Game fish include five species of trout, as well as seven other fish species. There are also seven nongame fish species on the forest. West slope cutthroat and bull trout are listed sensitive species on the Lolo.

Range. Livestock grazing allotments on the Lolo occur primarily on constricted riparian areas and on transitory ranges. The great majority of livestock grazing on the Lolo is by cattle. The exception to this is some limited horse grazing on the Seeley Lake and Plains Ranger Districts. The forest has 53 active allotments which make available an average of 9,600 AUMs annually on about 71,950 acres of land.

Timber. Commercially important tree species on the Lolo include ponderosa pine, Douglas-fir, lodgepole pine, western larch, Engelmann spruce, grand fir, subalpine fir, western white pine, western hemlock, and western red cedar. The forest plan annual allowable sale quantity (maximum amount of timber that can be sold – on a ten-year average – while guaranteeing a perpetual, sustained yield) is 107 million board feet (MMbf). In 1988, the forest

offered 86 MMbf for sale, 78 MMbf was purchased, and 64 MMbf was actually harvested.

Soil and Water. On the Lolo National Forest, soil textures range from sandy loam to clay loam, with slopes of 0 to 100 percent, and stone contents of 0 to 90 percent. Even though these extreme ranges exist, the average soil is a loam with a slope of 55 percent and a stone content of 40 percent. These soils are in various stages of vegetative cover because of timber sale activities plus 12,460 acres of bare ground tied up in roads.

Peak streamflows in the area generally occur during late spring or early summer with warm rains and mountain snow melt. Low flows occur in fall or winter.

Individual homes draw domestic water from several streams, lakes, and shallow aquifers on the forest. The human health risk assessment used in this EIS (Monnig 1988) analyzed two types of drinking water reservoirs for worst-case analysis of herbicide spill accidents. Lakes and reservoirs on the Lolo fall within the parameters of the two modeled reservoirs.

Minerals. Mining activity on the forest is increasing. Hard rock and placer mining cases have been higher than projected in the forest plan (229 cases in 1988, compared to the plan projection of 165 cases per year). In recent years, low grade gold deposits have become economically attractive because of increasing gold prices and advances in extractive methods such as cyanide heap leaching.

Lands. The lands program deals with rights-of-way, easements, special-use permits, donations, land exchanges, and encroachments. In 1988, the forest administered 567 special use permits: 83 for ditches, dams and water sources; 289 for roads; 33 for recreational residences; 75 for utility transmission and communication sites; 41 for outfitters and guides; and 46 for other uses including ski areas, resorts, and miscellaneous permits.

Roads. Road construction on the Lolo is generally associated with timber sales. There are now about 6,200 miles of road under Forest Service jurisdiction. Twelve percent of these roads are closed for wildlife and other resource protection, or to provide special walk-in hunting opportunities. In addition to these inventoried roads, there are about 1,800 miles of old logging spurs that were built for temporary project needs. That type of road is now commonly closed and revegetated as soon as the project is completed.

The arterial road system for the forest is nearly complete, more than three quarters of the collector system is in place. Less than one quarter of the local project road system is completed. In fiscal year 1988, the forest contracted for construction or reconstruction 88 miles of arterial and collector roads, and 92 miles of local roads.

Fire. All major vegetative types on the forest evolved with frequent wildfires caused by lightening and humans. Cyclic fires play a variety of ecological roles, including seedbed preparation, nutrient cycling, maintenance of seral plant communities and wildlife habitat, temporal and spatial mosaics of vegetative types and age-classes enhancing biological diversity, and reduction in fuel loading and continuity. After logging, prescribed fire is often used to reduce the risk of wildfire (by removing fuel) and to prepare the logged site for planting or seed germination of new trees. Prescribed fires are also used to improve big game winter range forage conditions. Fiscal year 1988 saw 41,525 acres of wildfire on the Lolo, and 7,943 acres of prescribed fire. The 1988 fire season was unusually severe, and about 35,000 acres of the 240,000 acre Canyon Creek wildfire was on the Lolo.

Air. The air quality in western Montana is generally good. The Missoula Valley does suffer from frequent temperature inversions – particularly in the winter – and the urban area around Missoula does not meet Federal air quality standards for particulates (wood smoke and road dust) and carbon monoxide. Failure to meet these standards occurs during weather-related episodes, usually in winter.

Alternative Development

All four action alternatives were developed with integrated pest management (IPM) principles. Each alternative has an overall objective, species-specific control objectives (see the Comparison of Alternatives section), and projected levels for indirect and direct control levels. Control objectives are defined below.

Control Priorities. Weed control projects should be focussed where they may have the greatest effect on preventing weed spread or damage to natural resources, and where they may have the greatest benefit to adjacent landowners who are actively trying to control weeds. The following three situations should receive the highest priority for weed control projects:

• areas that are now relatively free of weeds (including wilderness, trailheads, and unroaded areas);

• new infestations and small weed patches that threaten areas at high or moderate risk to weed invasion; and

• weeds on National Forest System land next to or near other ownerships where land managers have active weed control programs.

The following priority applies to all alternatives:

1) Support the establishment of a wide variety of biological control agents for each weed species. Ultimately, those weeds that are not eradicated should be kept in check at low densities by multiple biological enemies that would be self-perpetuating and would relieve the need for chemical and mechanical control efforts.

2) Prevent new invaders from becoming established on the forest. It is most effective to eradicate noxious weeds when they are new and occur in relatively small and isolated patches. The intensity of control action is also usually low at this point, often simply a matter of hand-pulling plants before they can go to seed. This approach requires that field going personnel be kept informed of new weed threats.
Contain established infestations. Keep weeds from spreading to new, unaffected areas.

4) Suppress existing infestations to reduce the effects of weeds on forest resources.

5) Eradicate established weed infestations.

Control Objective Definitions

ERADICATE	Attempt to totally eliminate a noxious weed species from Lolo National Forest lands, recognizing that this may not actually be achieved during the analysis period. However, eradication efforts would continue as long as detectable levels of the weed were present on the forest.
SUPPRESS	Prevent seed production throughout the target patch and reduce the area coverage of the weed. Prevent the weed species from dominating the vegetation of the area, but accept low levels of the weed.
CONTAIN	Prevent the spread of the weed beyond the perimeter of patches or infestation areas established as of 1988. **TOLERATE** weeds within established infestations, but **SUPPRESS** or **ERADICATE** outside those areas.
TOLERATE	Accept the continued presence of established infestations and the probable spread to ecological limits for certain species. Try to exclude new invaders through preventive practices.

Control Methods. All alternatives incorporate the same set of management requirements for weed prevention and spread reduction (Appendix D). Other indirect control methods—biologcal program and information program—vary by alternative. Direct control methods also vary by alternative (see the Comparison of Alternatives section), and are limited to the following:

■ ***Physical:*** Two physical methods are considered in this EIS: grubbing/pulling plants by hand, and mowing/topping plants with hand tools or power weed and brushcutting tools. Roadsides, administrative sites, and developed recreation sites might be mowed with tractors.

■ ***Biological:*** Three biotic agents are considered: the seed head weevil (*Rhinocyllus conicus*) for musk thistle; the defoliating beetle (*Chrysolina quadrigemina*) for goatweed; and goats to graze leafy spurge.

■ ***Chemical:*** Three herbicides are considered: **picloram** *(Tordon®)*, a broadleaf herbicide that is selective and persistent—the spectrum of affected plant species is limited and one application can be effective for more than one year; **2,4-D**, a less selective and non-persistent broadleaf herbicide; and **glyphosate** *(Rodeo®)*, a broad spectrum herbicide that is labeled for use in aquatic environments. Only hand-held and truck-mounted spray equipment would be used.

Alternatives Eliminated From Detailed Study. Three alternatives were eliminated: • *Aerial Application of Herbicides*, • *Moratorium on New Road Construction*, and • *Restoration of Natural Ecosystems and Plant Communities Forest-Wide.*

Description of Alternatives

The alternatives considered in detail are designed as programmatic guidelines and projections – they do not include specific projects. Site-specific analysis and documentation will be conducted at the project level. Treatment and impact levels for each alternative program are estimated assuming full funding and implementation; conditions that may not actually be fulfilled. The effects of each alternative may therefore be overestimated.

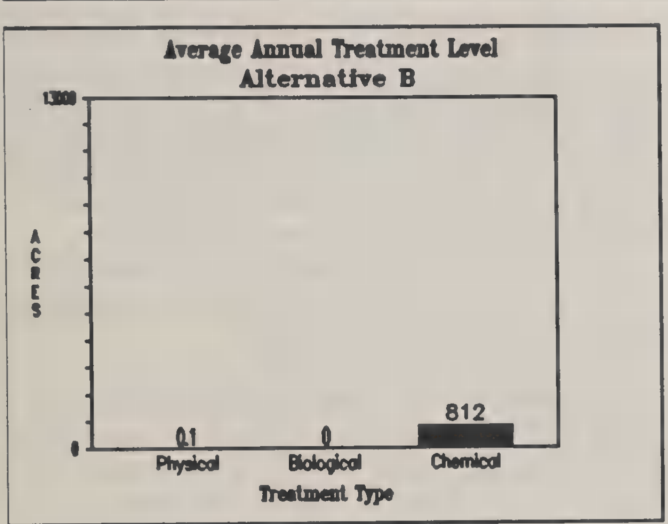
Alternative A: *no action* – continue current direction; attempt to prevent establishment of new weed species while tolerating those weeds already present. Support biological controls, employ limited physical control and no chemicals.

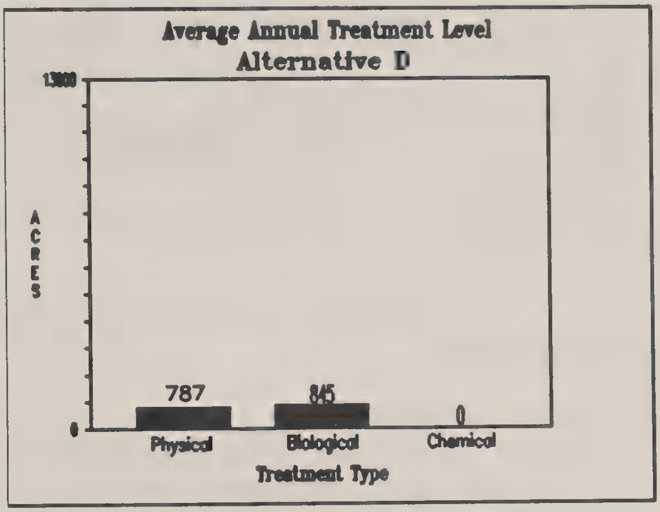
Alternative B: control weeds that affect adjacent landowners who have active weed management programs coordinated through a county weed board.

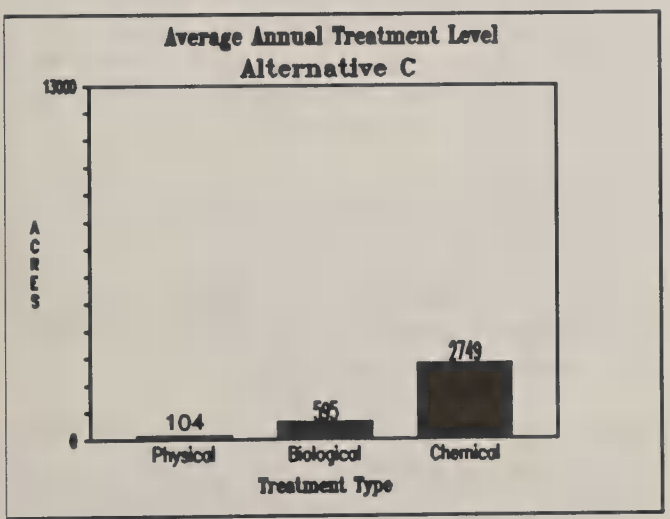
Alternative C: ***Preferred*** – control weeds that affect national forest resources or adjacent landowners who have active weed management programs.

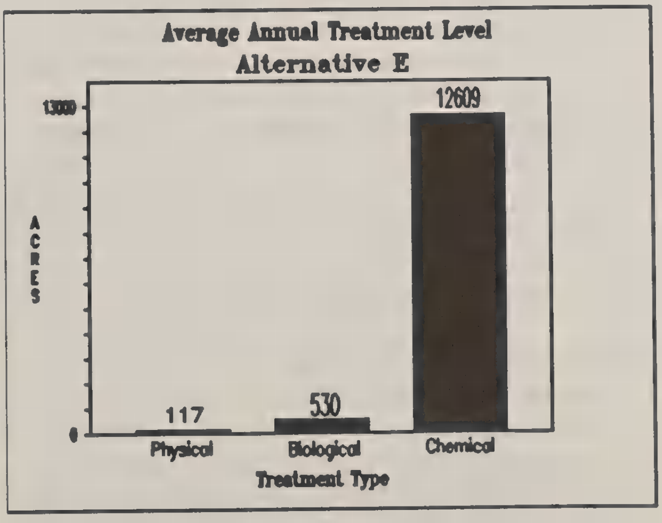
Alternative D: control weeds that affect national forest resources or adjacent landowners who have active weed management programs, but do not use chemical herbicides.

Alternative E: attempt to eradicate or suppress all noxious weeds on the forest.









Environmental Consequences

Chapter IV of the FEIS discusses environmental consequences in detail. The major conclusions that can be drawn from that chapter are that environmental impacts due to weeds or proposed weed control would not be significant for most resources. Two exceptions are wildlife, and range, which may be significantly affected by noxious weeds (see below). Human health effects are not expected to be significant in any alternative, but since there is some controversy over this issue, it will also be discussed below. Impacts by alternative are also summarized below, following the sections on human health, wildlife, and range.

Adjacent Landowners.

Weeds on National Forest land next to other landowners engaged in agricultural activities (cropland, rangeland, hay pastures) can interfere with those landowner's weed control programs. The FEIS does not quantitatively analyze those possible impacts, but it does recognize them. The range of alternatives includes cooperation with adjacent landowners as a primary objective in Alternatives B, C, and D.

Human Health.

Our analysis employs several conservative assumptions that overestimate the likelihood and severity of exposure, accidents, and resulting effects. Those assumptions include: higher application rates than proposed in this EIS; continuous application over an entire project area, rather than the spot application generally proposed; mixing and application errors that would not generally occur; residences and food sources much closer than would occur in most projects; dermal exposure estimates for workers failing to wear recommended protective clothing; and that there is no threshold or safe level for exposure to carcinogens.

Potential health risk is further overestimated by comparing long-term acceptable exposure levels to short-term, single event exposure. For instance, the U.S. Environmental Protection Agency (EPA) sets human Acceptable Daily Intake (ADI) levels for the maximum dose of substance that is anticipated to be without lifetime risk for daily consumption. Theses ADIs are generally set using a safety factor of 100 times the No Observed Effect Level (NOEL) for the most sensitive known species. Our assessment compares short-term exposure to these long-term safety levels. Doses received during one or a very few days out of the year are compared to daily lifetime safety levels.

Data gaps do exist and further studies are underway for health effects from all three herbicides, particularly in regard to carcinogenicity. Much of the existing cancer risk data are based on models that extrapolate animal studies to humans using models that incorporate safety factors to overestimate human effects. These models also use short-term, high doses instead of the long-term, lower doses that more likely comprise human exposure to carcinogens.

Toxicology. Unlike DDT and some other well-known pesticides, picloram, 2,4-D, and glyphosate do not bioaccumulate or biomagnify. Animals high on the food chain (humans, eagles, wolves) are not expected to acquire concentrated doses of these chemicals by feeding on contaminated plants or animals. These herbicides are water soluble, generally are not lipid soluble (they won't concentrate in fatty tissues), and they are excreted quite rapidly.

For the general population (non-workers), all worst-case scenarios result in doses that are well below known NOELs. Only a couple of improbable scenarios would exceed ADIs – a person consuming large amounts of unwashed, recently sprayed vegetation, and an adolescent spending an entire day in a right-of-way 2,4-D spraying project. In both these cases, doses would be short-term and would be far below NOELs. See Appendix G and Monnig (1988) for further discussion.

A very small percentage of the population may be hyper-sensitive to one or more of these chemicals. While the condition seems to be very rare, those that have it can suffer severe and long lasting symptoms after relatively small doses. Prevention of exposure is key to minimizing this risk.

Workers are at highest risk, especially those using backpack spray equipment. For picloram and glyphosate, all worker dose estimates are well below NOELs, and ADIs would be exceeded only by workers using backpack sprayers and failing to wear recommended protective clothing.

All workers using 2,4-D could exceed ADIs. Worst-case scenarios for workers not wearing protective clothing indicate that those workers could possibly have exposures approaching NOELs, and thus might be at some risk to effects on kidney function. Use of proper application methods and protective clothing can reduce this risk.

Major Accident Scenarios. Worst-case scenarios indicate that an herbicide spill into a drinking water reservoir would at most result in concentrations that exceed ADIs for less than one day. The probability of such an accident is far lower than one in 34,000 years.

Risk of Cancer and Mutation. Although human carcinogenic risk levels for these three herbicides appear to be quite low, scientific uncertainty still exists regarding the exact level of these risks.

Animal feeding studies indicate that carcinogenic effects for picloram, 2,4-D, and glyphosate are very weak to non-existent – perhaps on the same order as saccharin. Recent human epidemiological studies of 2,4-D have suggested that workers exposed to 2,4-D might have elevated cancer risks. However, these epidemiological studies have had inconsistent results. EPA has reviewed these studies and has decided that there is no need to further restrict the use of 2,4-D at this time. Additional studies are underway. Although inconclusive, the results of 2,4-D studies to date argue, at a minimum, for care in the use of 2,4-D to reduce worker exposure.

Based on the extrapolation of the results of animal cancer studies to humans, a lifetime of 2,4-D exposure (assuming 30 days of application per year for 30 years) could increase the worker's chances of getting cancer by about five chances in 100,000. Since the average American has about one chance in four of cancer from all sources, this cancer increase is still rather small. Picloram and glyphosate are 10 to 100 times less potent carcinogens than 2,4-D based on animal feeding studies. Thus, comparable doses would result in proportionately less cancer risk.

One-In-A-Million Risks of Cancer Death

Source of risk	Type and amount of exposure
Herbicide Worker[1]	2,4-D: 137 days picloram: 11,236 days glyphosate: 41,667 days
Cosmic rays	One transcontinental round trip by air; living 1.5 months in Colorado compared to New York; camping at 15,000 feet over 6 days compared to sea level.
Eating & drinking	40 diet sodas (saccharin) 6 pounds of peanut butter (aflatoxin) 180 pints of milk (aflatoxin) 200 gallons of drinking water from Miami or New Orleans 90 pounds of broiled steak (cancer risk only)
Smoking	2 cigarettes
Other	20 days of sea level natural background radiation; 2.5 months in masonry rather than wood building; 1/7 of a chest x-ray using modern equipment.

[1]Assumes backpack spraying, average dose, and recommended protective equipment and procedures.

Cancer risks to members of the general public are 100 to 1,000 times less than the risk to workers when considering exposure to the same herbicide. Risks on this order could not be detected by epidemiology studies as conducted by the National Cancer Institute.

Wildlife.

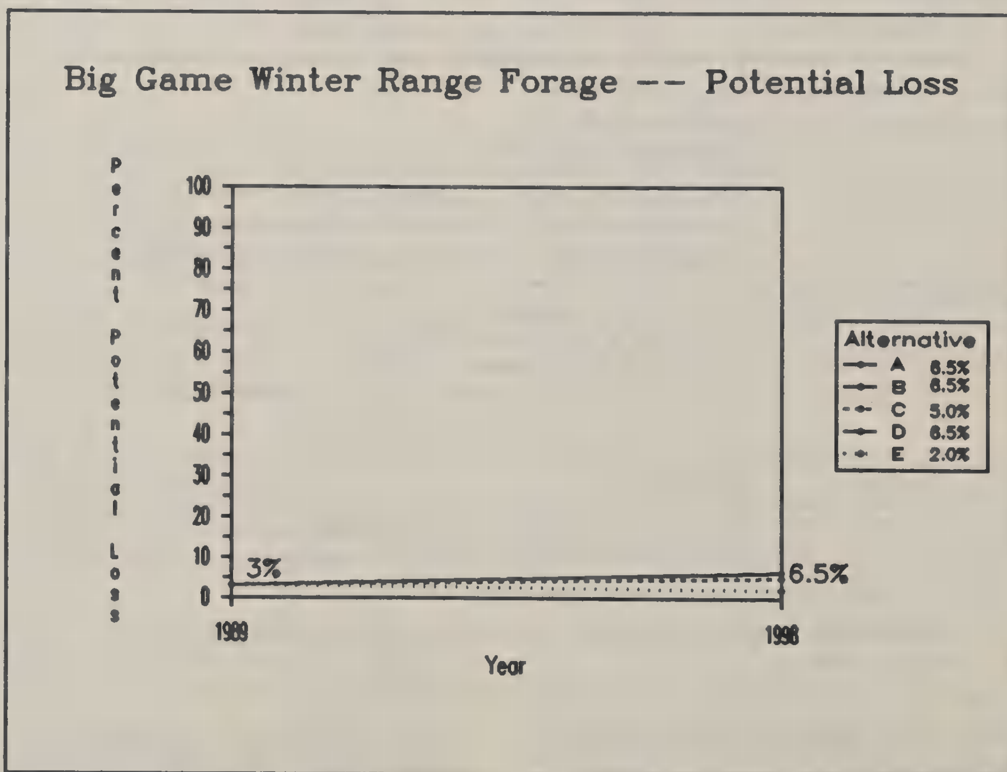
Nongame, predator, and Threatened and Endangered species are not significantly affected by noxious weeds. No wildlife would be significantly affected by proposed weed control methods (except for a positive effect where weed control might reduce losses in big game forage).

Under worst-case assumptions, big game (elk) winter range forage production could be significantly reduced forest-wide in the next 50 years. The current state of knowledge does not allow the reliable translation of winter range forage losses into changes in elk population numbers.

Estimated Forage Production Loses. Using worst-case assumptions, the current big game forage production loss due to weed infestations is about three percent. Under no action, forage loss in 50 years may increase to 18 percent of potential. Actual impacts on elk winter range productivity will likely be in the lower end of the 3-18 percent range. The estimated three percent loss in productivity is probably insignificant on a forest-wide basis. The reason for this is the questionable role that winter forage has on winter survival, the mobility of elk and their ability to use alternative winter ranges, the availability of at least some surplus forage in portions of the winter range, and the ability for big game to utilize knapweed.

The figure below shows worst-case big game forage losses over the next decade for each alternative. With no action (Alternative A), loss in potential productivity might rise from the current three percent to 6.5 percent. Alternatives B and D would show similar losses, while Alternative C would go to five percent in ten years. Only Alternative E shows an improvement at the end of the decade, moving from the current three percent to a two percent loss.

Because the actual impact of weeds on elk winter survivability and population numbers is unknown, the Lolo is pursuing cooperative research proposals with other agencies including the Bureau of Land Management, the University of Montana, the Montana Department of Fish, Wildlife, and Parks, and the Rocky Mountain Elk Foundation.

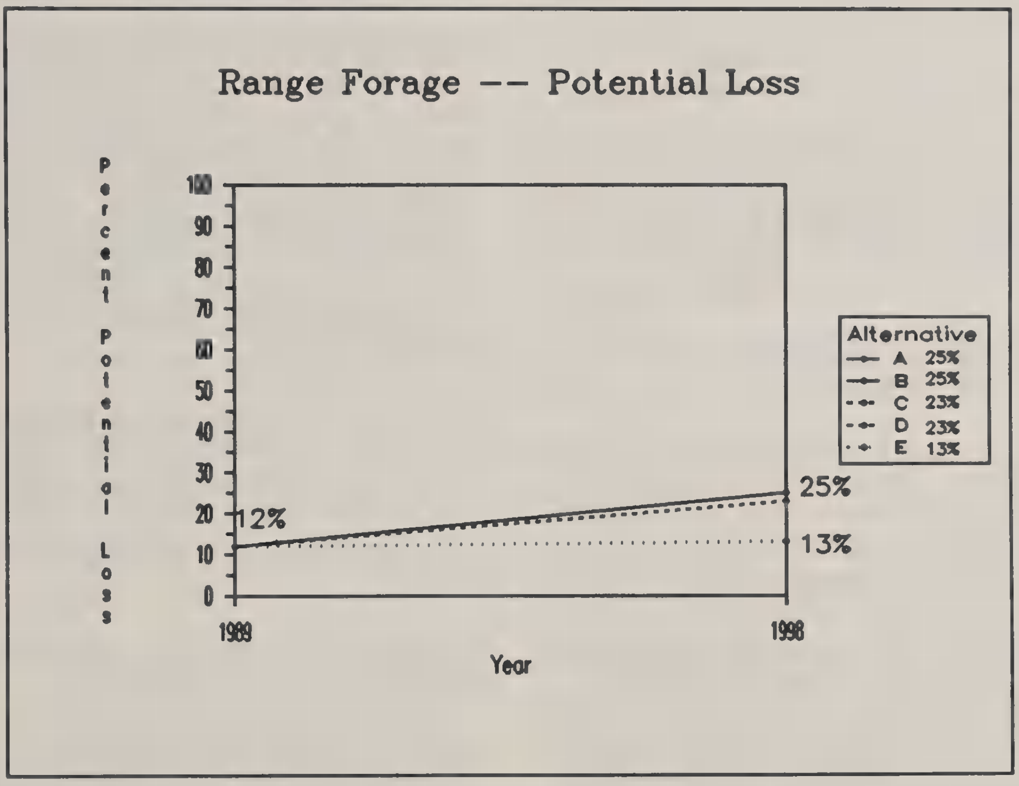


Worst-Case Loss in 1998 Potential Big Game Winter Range Forage, by Alternative

Range.

Forage Loss Due to Weeds. Current range productivity losses due to noxious weeds may be 1,290 Animal Unit Months (AUMs). In other words, the forest-wide range capacity without any noxious weeds could be 10,890 AUMs (the actual current grazing level is 9,600 AUMs). This represents a 12 percent decrease in range capacity due to the current presence of noxious weeds (1,290 ÷ 10,890 x 100% = 12%). An additional 1,450 AUMs may be lost forest-wide over the next ten years if no additional control action is taken. This would result in a 25 percent reduction in potential (weed free) range carrying capacity ((1,290 + 1,450) ÷ 10,890 x 100% = 25%), or a decrease from the current 9,600 AUMs to approximately 8,150 AUMs (8,150 AUMs is 15% less than the current 9,600 AUM capacity).

The following figure shows the worst-case losses in potential livestock forage productivity over the next decade. All alternatives except E would go from the current twelve percent loss to a loss of 23 to 25 percent. Alternative E would remain fairly constant, ending the decade with a 13 percent loss.



Worst-Case Loss in 1998 Potential Range (Livestock Grazing) Forage, by Alternative

Other Resources.

The impacts of weeds on other resources are either ambiguous or insignificant. For instance, impacts on visual quality can be negative (for people aware of and concerned about noxious weeds), positive (for people who like the color provided by flowers and fall vegetation), or neutral (for most casual observers who don't notice the weeds at all during much of the year). Weed impacts on recreation also depend largely on people's awareness and values. Some weeds can be scratchy and irritating on some recreation sites.

The effects of weed control on other resources often include the same subjective elements. Some people would notice and approve, others would

notice and disapprove, while many simply would not notice at all. Chemical herbicides would present some risk to aquatic organisms, sensitive plants, conifers, and other nontarget plants. Mitigation measures discussed in Chapter IV and Appendix D should eliminate virtually all of those risks. The probability of an herbicide spill into a waterway is extremely small, but such an accident could have significant short-term impacts on the aquatic environment such as limited fish kills. Mitigation measures are included to minimize the risk and severity of an accident like this.

Summary of Impacts by Alternative.

***Alternative* A.**

The No Action Alternative relies on very limited use of mechanical and biological controls to slow weed spread. It emphasizes prevention and proposes virtually no direct control action. No chemical use is proposed.

Human Health and Safety. There would be no significant effect under this alternative.

Vegetation. Expansion of areas infested by noxious weeds would continue at about present rates. Short term results may be development of monocultures of spotted knapweed, goatweed or leafy spurge on heavily infested sites. Continued pressure will occur on sensitive plants in some locations. Long term results of biological control may eventually reduce the density of some weed species. However infestation of all suitable sites for a particular weed would probably occur. Ecological diversity would eventually stabilize at some point in the future, with noxious weeds maintaining a presence at the expense of native plants.

Recreation. In developed sites weeds would continue to invade campgrounds, picnic areas and beaches, degrading the sites and the recreation experience. Noxious weeds would continue to degrade the dispersed recreation experience across the forest and in Wilderness because of loss of aesthetic values and vegetative variety.

Cultural Resources. Some historic sites would continue to have the visual aspect of their historical integrity compromised.

Visual Quality. Landscapes would continue to be affected, with impacts increasing from existing species as they spread their ranges to biological limits. Proposed control measures would have negligible effects on visual quality.

Wildlife. Ten more years of no weed control could result in a 6.5 percent reduction in big game winter range forage production potential. This compares to an estimated current loss of three percent. This worst-case projection could climb to an 18 percent loss of potential in 50 years. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Alternative A has the lowest risk to the fisheries and aquatic resources since no weed control activities are proposed and these weeds do not negatively impact these resources. Fish populations and habitats would remain essentially unchanged. Normal preventive measures are not expected to impact the aquatic resources to any measurable extent, except where these measures reduce sediment and improve habitat conditions.

Range. This alternative could result in a decrease of around 1,450 AUMs by 1998. This represents a 15 percent reduction in carrying capacity when compared to 1988 AUM levels (9,600 AUMs) or about 25 percent less than the potential without weeds.

Timber. There would be no significant effects on timber resources or activities.

Water and Soils. This alternative would eliminate the risk of any chemical contamination due to weed control activities. It would allow weed infestations to advance basically unchecked. This would allow a slight increase in sediment production and water yield increase in those areas where weeds are the major component of the plant community. Areas where this is a concern would be the drier habitats on the forest. These areas already have higher sediment and water yield delivery so continued and increasing infestations would enlarge to situation. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative **B.**

Human Health and Safety. Risks to human health and safety would be very slight, given the small amount of herbicide application proposed. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. Only minor differences would be noted in the effect on vegetation between Alternatives A and B. Treatment of about 1,900 acres by chemicals during the decade would have an adverse impact on some forbs and shrubs, and could result in their elimination from some communities. A minor increase in the ecological integrity of the forest could be expected by reducing the rate of increase in some weeds. Sensitive plants could be adversely affected if spraying occurs where they are established. This loss could be expected to be higher from spraying than from normal expansion of noxious weed as experienced in Alternative A.

Recreation. Same as Alternative A.

Cultural Resources. Same as Alternative A.

Visual Quality. Same as Alternative A, but with a slight reduction in weed spread.

Wildlife. Assuming that the limited control measures would reduce some weed spread on both national forest winter range, and on adjacent non-Forest Service lands, this alternative might result in a loss of winter range forage production potential of six percent after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Possible impacts to the aquatic resources would be greater than in A, but to a relative degree. Impacts could come from herbicide spills or grazing in riparian ecosystems, but should be minimal to nonexistent if proper safeguards and listed mitigation techniques are employed.

Range. Treatments under this alternative could result in a decrease of about 1,430 AUMs by 1998. This represents an approximately 15 percent reduction in carrying capacity when compared to 1988 AUM levels, or 25 percent less than potential capacity without weeds, and is virtually the same as Alternative A.

Timber. Chemical use implies potential for some damage to conifers, but the impact would be insignificant due the habitat types and limited acreage proposed for treatment.

Water and Soils. The areas selected for treatment would generally be in the lower elevations adjacent to private lands where treatment is already occurring. Due to the locations of these treatment areas, potential contamination is generally limited to non-riparian landscapes. Because of the elevations, the sites treated would be the drier ones and would show a slight benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative **C.** *(Preferred)*

Human Health and Safety. Risks to human health and safety would still be very slight, but slightly higher than Alternative B. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. This alternative would result in some reduction in acres of diffuse knapweed, musk thistle, houndstongue, and dalmatian toadflax. It would also slow the expansion the other species. This reduction would be achieved by spraying about 6,600 acres. On these acres there would also be a loss in forbs and shrubs which would reduce ecological diversity. Sensitive plants found on dry sites would be at a higher risk than the two previous alternatives. Only a minor risk is present for sensitive plants on moist sites. A minor area of physical control will have limited effect on ecological diversity

and potentially a minor impact on sensitive plants. Biological control efforts should reduce the weed risk to sensitive plants where they are effective.

Recreation. In developed sites this alternative would result in control of weeds in campgrounds, picnic grounds, on beaches and other intensively used areas where weeds detract from the recreation experience. Some people would avoid chemically treated sites and would feel that their recreation opportunities had been reduced.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved. Notification and consultation with Native American Cultural committees could prevent the use of herbicides from impacting Native American religious and traditional values.

Visual Quality. This alternative would allow the treatment of recreation facilities, administrative sites, and other areas with herbicides. Noticeable visual impacts appear largely limited to these areas.

Wildlife. Assuming that the control measures under this alternative would reduce some weed spread somewhat more than in Alternative B, about 5 percent of winter range forage production potential might be lost after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Possible impacts to the aquatic resources would be greater than in B, but still small. Impacts could come from herbicide spills or grazing in riparian ecosystems, but should be minimal to nonexistent if proper safeguards and listed mitigation techniques are employed.

Range. Under this alternative, physical, biological, and chemical control measures would be taken on a wide variety of sites. After a site specific analysis, treatments could occur on suitable National Forest sites in active grazing allotments. Treatments under this alternative could be directed toward range allotments if infestations of difficult to control weeds were small (and manageable) or threatened other high value resources. Little or no large scale treatment of spotted knapweed or leafy spurge would be anticipated due to the low likelihood of any significant long term decrease in these weeds. Treatments under this alternative course of action could result in a decrease of an estimated 1,240 AUMs by 1998. This represents an approximately 13 percent reduction in carrying capacity when compared to 1988 AUM levels, or 23 percent less than potential capacity without weeds.

Timber. Some damage could occur to non-target conifers if mitigation measures are not followed. On a forest-wide basis, these effects would be insignificant.

Water and Soils. The areas selected for treatment with chemicals would generally be in the lower elevations adjacent to private lands where treatment is already occurring, and mid-elevation zones that support drier habitats. Treatment of some riparian zones would occur, but these spots would be small. This is due to the limited number of acres that are infested in these zones. Treated sites would generally show a benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

***Alternative* D.**

Human Health and Safety. No significant effects would occur.

Vegetation. This alternative has no risk to ecological diversity or sensitive species as a result of chemical use. Expansion of existing weed populations will be similar to Alternative B, although certain species would be limited. Musk thistle, houndstongue, and dalmatian toadflax would show reductions in acreages as a result of physical and biological treatments. On these sites, biological diversity will be maintained or improved, and sensitive plants will have less competitive pressure. A minor risk to sensitive plants exists as a result of grubbing and pulling operations. The more competitive noxious weeds like spotted knapweed, leafy spurge, and goatweed will continue to expand, and the threat of monocultures exists on some of the drier sites.

Recreation. Physical and biological control could improve the quality of some recreation sites, but to a lesser extent than under Alternatives C and E. Those who want to avoid chemically treated areas would not feel that their opportunities were reduced by chemical use. Where grazing is used, some temporary site quality degradation would be caused by the presence of animals and their feces.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved, provided that non-chemical treatment methods are effective and funded.

Visual Quality. Visually, this alternative is very similar to Alternative C, but with less control of leafy spurge. This alternative would be somewhat less effective than Alternative C where chemical control provides less expensive or more reliable control. Lack of herbicide options means fewer treated acres.

Wildlife. Very little knapweed would be controlled under this alternative, so big game winter range effects would be similar to those estimated for Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. The elimination of the use of chemical herbicides in this alternative results in reduced risks to the fisheries and aquatic resources, compared to alternatives B and C. Grazing used for biological control might have negative impacts if not managed correctly. Impacts to aquatic resources should be minimal if listed mitigation measures are followed.

Range. Under this alternative, only physical and biological control measures would be taken on a wide variety of sites. After site specific review to determine likelihood of success, treatments could occur on suitable National Forest sites in active grazing allotments. Little or no large scale direct control measures on spotted knapweed or leafy spurge would be practical. Treatments under this alternative could result in a decrease of around 1,265 AUMs by 1998. This represents an approximately 13 percent reduction in carrying capacity when compared to 1988 AUM levels, or 23 percent less than potential capacity without weeds.

Timber. No significant effects.

Water and Soils. This alternative would eliminate the risk of any chemical contamination due to weed control activities but would treat approximately 1,635 acres with other methods. The areas selected for treatment would be in the lower elevations adjacent to private lands. Because of the elevations, the sites treated would be the drier ones and would show a slight benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

***Alternative* E.**

Human Health and Safety. Risks to human health and safety would be higher than Alternative C, but still very slight. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. Reductions in acreage of most of the noxious weeds can be expected from this alternative, which would be favorable for ecological diversity and maintenance of sensitive species. The use of chemicals on almost 31,000 acres could have a significant impact on sensitive plants, with a high probability of a loss of one or more colonies of a particular plant. Sensitive plants on moist as well as dry sites would be affected. Similarly, ecological diversity on these chemically treated sites would be disrupted by the loss of some forbs and shrubs. The overall impact on vegetation would be negative in the short-term, with a significant chance of loss of some portion or all of a sensitive plant population. Over a longer time frame, ecological diversity should be maintained, but losses to the sensitive plant population could not be recovered. Impacts from physical and biological treatments would be minor.

Recreation. In developed sites this would be the same as Alternative C. Dispersed recreation would be improved because the spread of weeds would be stopped, and there may be some reduction in weeds across the forest. The effects of the chemical

would not be sufficient to cause impact on fish, water quality or wild animals so the only adverse effect to the dispersed recreationist would be felt by those who want to avoid chemically treated areas. Those people might feel that their recreation opportunities had been significantly reduced. This would be a short-term effect.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved. Notification and consultation with Native American Cultural committees could prevent the use of herbicides from impacting Native American religious and traditional values.

Visual Quality. This alternative would have no negative impacts on the visual resource, other than potential short-term impacts of dead and dying weeds. Additional road closures in this alternative would reduce viewing opportunities for vehicular traffic in some parts of the forest.

Wildlife. Assuming that the extensive control measures under this alternative would reduce some weed coverage below today's levels, about two percent of winter range forage production potential might be lost after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. The potential for major deleterious impacts to fisheries and aquatic resources is the greatest with this alternative. The extensive use of herbicides proposed increases the risk of accidental spills or overspraying. The severity of such impacts (for instance a spill into a stream) would be the same as alternatives B and C, but the likelihood of such an event would be higher in this alternative. The actual risk of significant impacts is still quite low, provided that proper safeguards and listed mitigation measures are followed.

Range. Under this alternative, the mere presence of a weed would be considered an unacceptable impact, and an attempt to eliminate all weeds from the Lolo National Forest would be made using all available control measures. All active and inactive range allotments would be included in this high emphasis control effort. Treatments under this alternative could result in a decrease of an estimated 175 AUMs by 1998. This represents an approximately 2 percent decrease in carrying capacity when compared to 1988 AUM levels, or 13 percent less than the potential capacity without weeds.

Timber. Some damage could occur to non-target conifers if mitigation measures are not followed. On a forest-wide basis, these effects would be insignificant.

Water and Soils. There would be little consideration for elevational differences and all weed infestations would be attacked aggressively. This alternative would have the highest risk of contamination to the environment due to the large number of acres treated. Treatment of some riparian zones would occur but these spots would be small, because of the limited number of acres that are infested in these zones. Due to the large number of acres treated this alternative would show a benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. Additional road closures could reduce the road miles available for public motorized use. There would be no other significant effects on road activities.

Comparison of Alternatives

The following tables and graphs compare the alternatives from a variety of perspectives. The estimated numbers that are displayed and compared below should be treated as relative rather than absolute numbers. The intent of these comparisons is to allow a reasoned choice among the alternatives. Actual implementation and the resulting numbers would depend on funding, cumulative site-specific factors, and unforeseeable details. The assumptions used to develop these numbers tend to over-estimate both impacts and control effectiveness. For these reasons, the following numbers should be used for comparison between the alternatives only.

Species Control Objectives. Each of the nine weed species is assigned a specific control objective under each alternative, as shown in the next table. These objectives were set by evaluating the overall objective for each alternative, the impacts caused by each weed species, and the effectiveness of control methods available under the alternative. See page S-8 for control objective definitions.

Comparison of Control Objectives[1] by Species

	A	B	C	D	E
SPOTTED KNAPWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS in Co-op areas & Special MAs; CONTAIN & seek biological control in other areas.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	SUPPRESS wherecanopy is open (<55%);CONTAIN wherecanopy is closed (>55%)
DIFFUSE KNAPWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	ERADICATE.
CANADA THISTLE	TOLERATE, seek biological control.	CONTAIN in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	CONTAIN in Co-op areas and Special MA's; TOLERATE, seek biological control in other areas.	CONTAIN in Co-op areas and Special MA's; TOLERATE, seek biological control in other areas.	SUPPRESS.
MUSK THISTLE	TOLERATE, seek biological control.	TOLERATE, seek biological contorl.	ERADICATE.	ERADICATE.	ERADICATE.
GOATWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS in Special MAs & Co-op areas; CONTAIN elswhere.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	SUPPRESS.
HOUNDSTONGUE	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS.	SUPPRESS.	ERADICATE.
LEAFY SPURGE	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS new infestations and in Co-op areas; CONTAIN elswhere.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	ERADICATE new infestations; SUPPRESS established infestations.
TANSY	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE in other areas.	ERADICATE new infestations & roadsides; CONTAIN established infestations.	SUPPRESS in Co-op areas; TOLERATE in other areas.	ERADICATE new infestations; SUPPRESS established infestations.
DALMATIAN TOADFLAX	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE in other areas.	SUPPRESS.	SUPPRESS.	SUPPRESS.
NEW INVADERS	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE

[1]Control objectives are defined on page S-8.

Weed Control Programs and Treatments. Two types of control actions are proposed in this EIS. ***Indirect Actions*** are programs that are not direct, on the ground treatment activities. These include funding for biological control research, information activities, management requirements to prevent or reduce weed spread, and mapping and inventory activities. ***Direct Treatments*** are measured in acres of weed infestations that are actually treated with physical, biological, or chemical control methods.

Indirect Actions. The next table compares four programs for indirect weed control under each alternative. The information program ranges from informal in-service training in weed recognition for field-going personnel to brochures and advertising campaigns to increase public awareness of weeds. The prevention program includes numerous management requirements listed in Appendix D, and is the same for all alternatives except E, which also adds weed spread prevention as a criterion

for road and area closures to motorized use. The weed inventory program varies in intensity to match the level of weed control in each alternative. The biological program covers money allocated to cooperative and cost-share biological research projects. The biological program does not include the biological treatments listed under direct control treatments.

Comparison of Indirect Actions

	A	B	C	D	E
INFORMATION PROGRAM (Decade)	LOW (in-service) **$0**	LOW (in-service) **$0**	MORE (in-service & brochure) **$2,000**	MORE (in-service & brochure) **$2,000**	MOST (in-service, brochure, & ad campaign) **$12,000**
PREVENTION PROGRAM	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D) plus revised travel plan for more area & road closures
INVENTORY PROGRAM (Decade)	New invaders, only as encountered **$0**	New invaders, only as encountered; Comprehensive mapping of Co-op Areas **$5,000**	Systematic mapping of high-risk areas; Comprehensive mapping of Co-op Areas **$10,000**	Systematic mapping of high-risk areas treatable w/o chemicals; Comprehensive mapping of Co-op Areas **$7,500**	Systematic mapping of entire forest **$60,000**
BIOLOGICAL PROGRAM (Annual)	**$0**	**$7,000**	**$10,000**	**$25,000**	**$25,000**

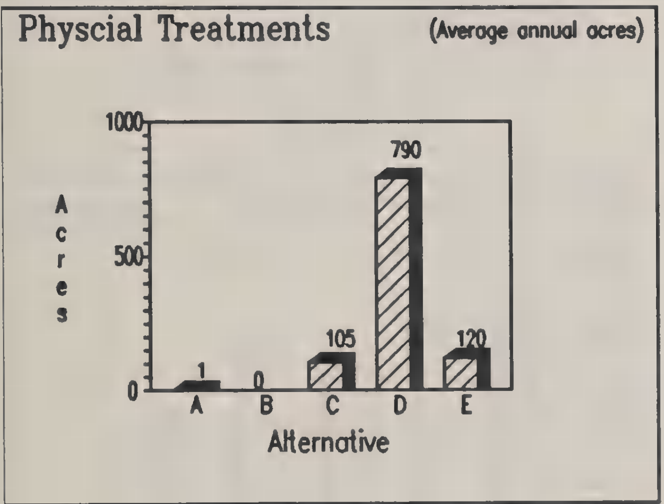
Direct Control Treatments. The following table compares annual acres treated with the three direct control methods. It also shows forest-wide percentage change in total weed acres over the next decade. Under no action (Alternative A), weed increase by five percent in ten years. Weeds continue to increase, but at slower rates for alternatives B, C, and D. Only under Alternative E would weed acreage decrease.

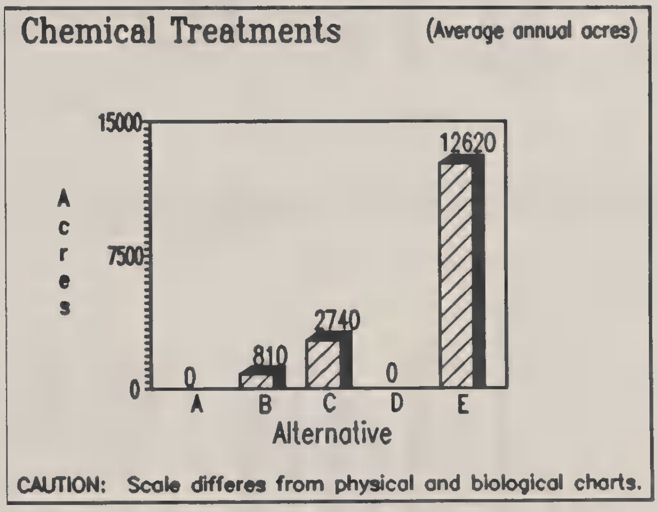
The table is followed by four charts that graph each row in this table.

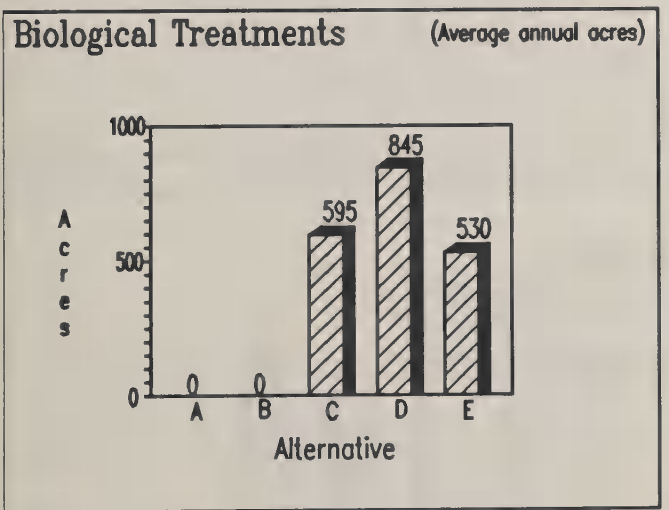
Comparison of Direct Control Treatments (acres per year)

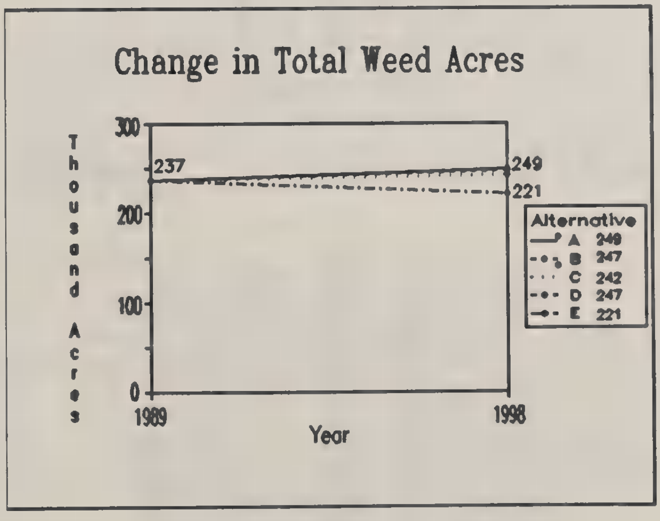
	A	B	C	D	E
PHYSICAL TREATMENTS	1	0	105	790	120
BIOLOGICAL TREATMENTS[1]	0	0	595	845	530
CHEMICAL TREATMENTS	0	810	2,740	0	12,620
CHANGE IN INFESTED ACRES (1989-1998)	+5%	+4%	+2%	+4%	-7%

[1]Does **not** include Indirect Biological Actions shown in previous table.



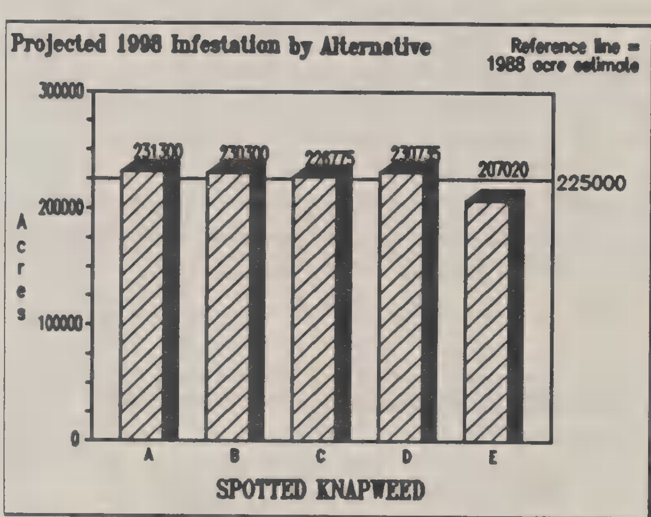


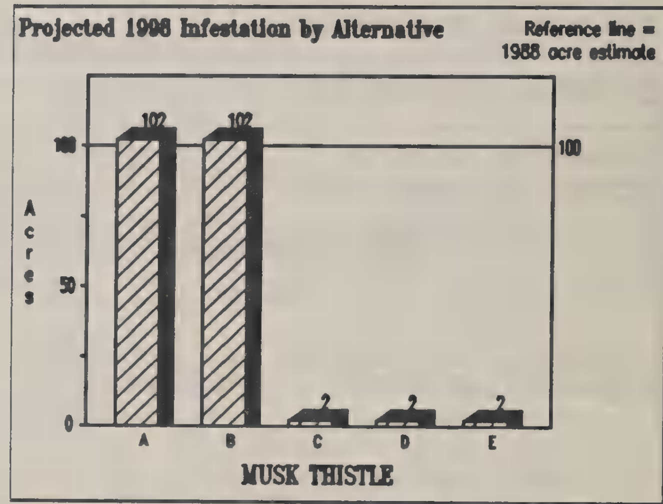


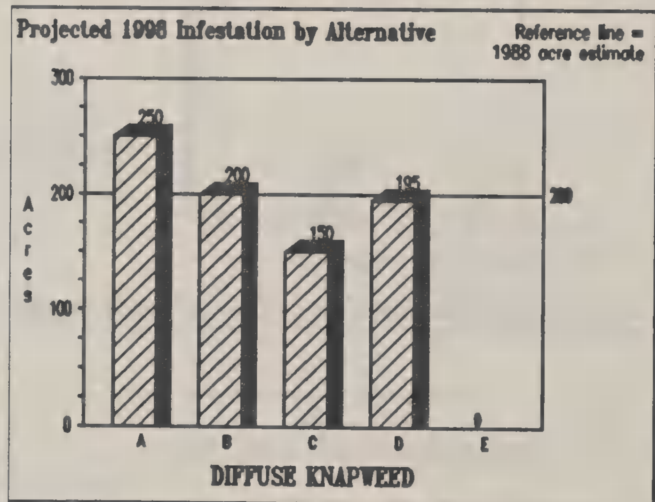


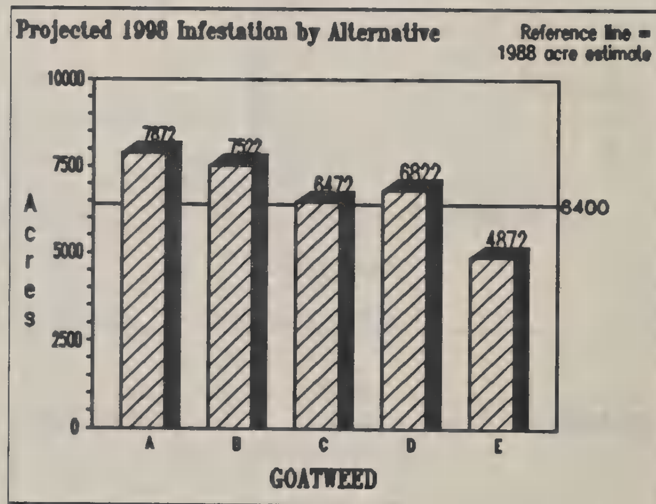
Projected 1998 Weed Infestation Acres

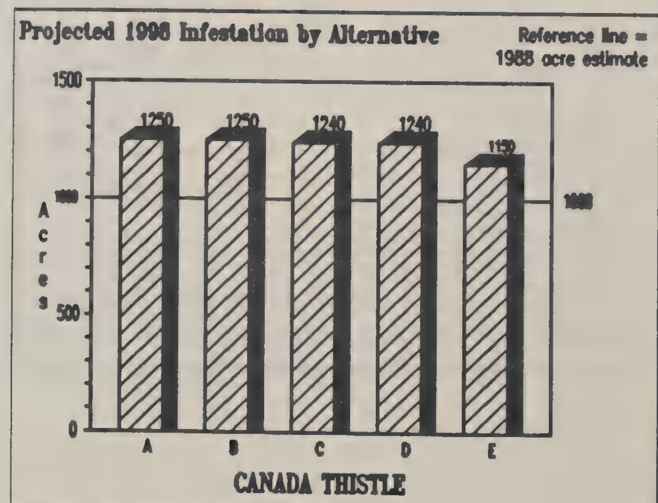
The next nine graphs show the projected weed acres for each species, by alternative, at the end of the next ten years. Please notice that the acre scale is different for each weed. The horizontal line in each graph shows the current (1989) acre estimate.

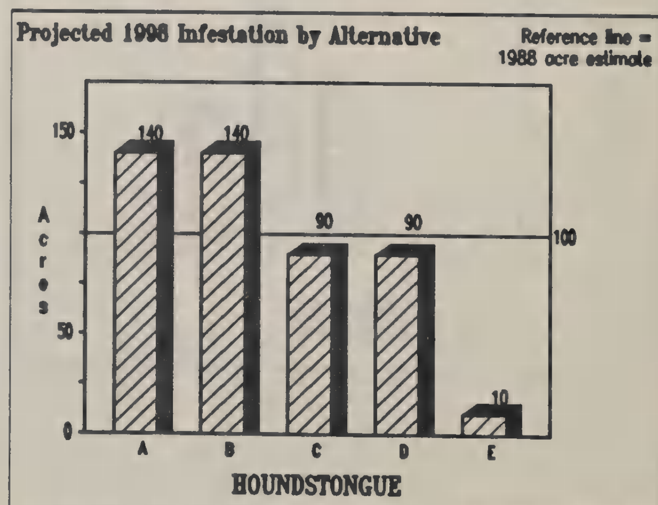


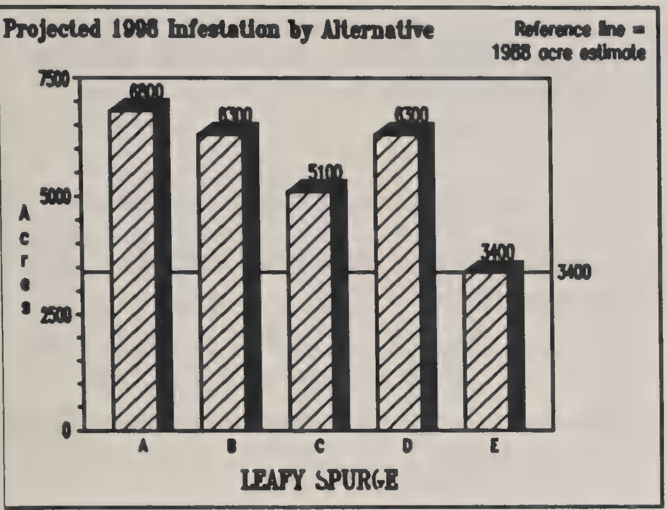


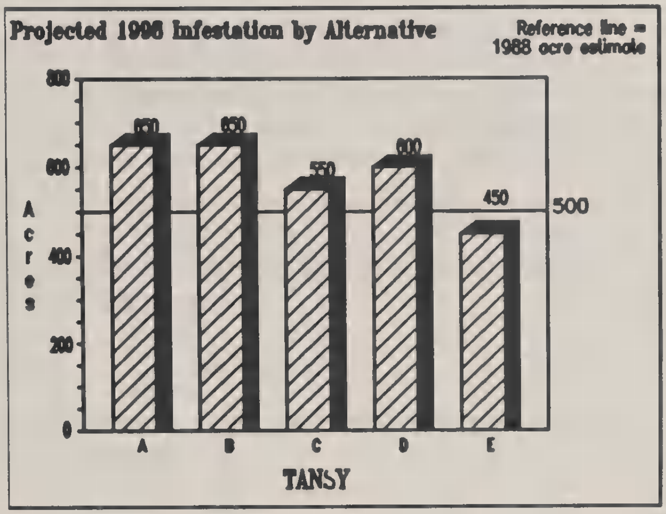


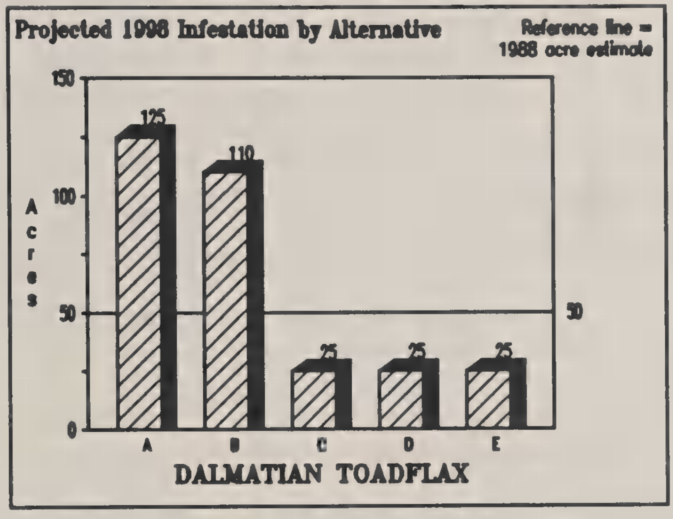












Economics. Total cost, cost per acre, and percent of current budget for each alternative are compared in the following table. Chemical treatment is generally less expensive than physical or biological treatment. That is why cost per acre is lowest in Alternative B, which uses only chemical methods. Cost per acre is highest in alternatives A an D, which use no chemicals. Even though cost per acre is higher, total cost is lower for D compared to C. This is because fewer acres are treated in D.

Comparison of Economics

	A	B	C	D	E
TOTAL COST[1] (Annual)	$500	$73,600	$360,700	$278,800	$1,422,900
COST PER ACRE[2] (Annual)	$95	$32	$42	$98	$42
PERCENT OF CURRENT BUDGET[3]	0.00%	0.5%	2.4%	1.9%	9.5%

[1]Indirect Actions ***plus*** Direct Control Treatments.
[2]Direct Control Treatments only — does ***not*** include the indirect program costs.
[3]Current annual budget for the Lolo National Forest is approximately $15,000,000.

The next table shows economic changes from the current situation for each alternative. The only benefits of weed control that are given economic values in this analysis are range and big game forage productivity. The dollar figures shown below do not account for other benefits of weed control. These values should not be interpreted as absolute values—they should only be used for comparison among the alternatives.

Average Annual Change[1] in Value of Potential Range and Wildlife Outputs Compared to the Current Situation

	A	B	C	D	E
Range	−$10,000	−$9,800	−$8,500	−$8,700	−$1,200
Wildlife (Big Game)	−$36,700	−$31,600	−$21,000	−$36,700	+$10,600
TOTAL VALUE	−$46,700	−$41,400	−$29,500	−$45,400	+$9,400
Value Change Compared to No Action	0	+$5,300	+$17,200	+$1,300	+$56,100
Annual Weed Control Cost	$500	$73,600	$360,700	$278,800	$1,422,900
Cost Change Compared to No Action	0	+$73,100	+$340,200	+$278,300	+$1,422,400
Benefit-Cost Ratio of Change Compared to No Action	0	0.07	0.05	< 0.00	0.04
Annual Net Value Compared to No Action	0	−$67,800	−$343,000	−$277,000	−$1,366,300
Present Net Value[2] Over 10 Years Compared to No Action	0	−$549,900	−$2,782,000	−$2,246,700	−$11,081,900

[1]Using output level at midpoint of decade, worst-case scenario, and 1985 RPA unit values.
[2]Using 4% discount rate.

The last table (next page) shows estimated changes in income and employeemnt for each alternative. These economic impacts include direct, indirect and induced effects on income and employment in the five counties of Flathead, Missoula, Mineral, Ravalli and Sanders. The majority of change in jobs and income is a result of changes in elk numbers and related hunting activity. The positive economic impacts estimated for Alternative E are a result of the expected one percent increase in elk numbers by the end of the first decade. For this EIS, economic impacts are not estimated beyond the first decade of implementation.

Total Economic Impacts from Changes in Grazing Outputs and Hunting RVDs Compared to the Current Situation (1st Decade)

	A	B	C	D	E
Total Income	−$389,000	−$389,000	−$233,000	−$384,000	+$97,000
Annual Average Employment (jobs)	−3.0	−2.7	−1.9	−2.9	+0.5

Reader's Guide to the FEIS

Format. Readers who are not familiar with environmental impact statements may find the format and chapter order of the FEIS a little strange. This format is specified in Federal Regulations set down by the Council on Environmental Quality (36 CFR 1502.10). ***Please consult the Table of Contents (pages iii-vii) for the actual contents of this FEIS).***

The Council on Environmental Quality format goes like this:

(a) **Cover sheet**

(b) **Summary**

(c) **Table of contents**

(d) **Purpose and need for action**

(e) **Alternatives** (comparison based on the affected environment and environmental consequences sections)

(f) **Affected environment**

(g) **Environmental consequences** (provides the scientific and analytic basis for comparisons in the alternatives section)

(h) **List of Preparers** (including qualifications—expertise, experience, professional disciplines)

(i) **List of agencies, organizations, and persons** to whom copies of the statement are sent.

(j) **Index**

(k) **Appendices**

This format does not follow the chronological order of the analysis process. And it doesn't make sense to read an EIS from front to back. For instance, this analysis took the following order:

- **Purpose and Need** (Chapter I)
- **Description of Alternatives** (Chapter II, first part)
- **Environmental Consequences** (Chapter IV)
- **Comparison of Alternatives** (Chapter II, second part)

Knowing this format and the reader aides described below will help you skip through the FEIS to find the topics that you want to read about.

Reader Aides. The FEIS includes a detailed table of contents and an index to help you find topics. The first page of each chapter has an overview of the chapter's organization, including a list of section headings. These section headings are also printed in the top outside margin of each page to help you thumb through the chapter.

CHAPTER I — PURPOSE AND NEED

Chapter I.

PURPOSE AND NEED FOR ACTION

This chapter has eight sections:

- **Purpose** – explains why this EIS is written;
- **Need for Action** – explains why the proposed alternative actions are needed;
- **Problem Statement** – describes the need for action in the form of a problem;
- **Scope** – explains the programmatic nature of this analysis, and tells how project-specific analyses will be documented;
- **Direction** – cites the laws and regulations that authorize, direct, and control the proposed alternative actions;
- **Previous Analysis** – cites earlier reports that have addressed the purpose and need for the proposed actions;
- **Noxious Weed Definitions** – provides the legal definitions for noxious weeds, and lists the weed species addressed in this EIS;
- **Issues** – discusses the issues that guided alternative development and effects analysis.

Purpose.

The Lolo National Forest is proposing a program to manage noxious weeds on the National Forest System lands within its boundaries. This environmental impact statement (EIS) documents the five alternative programs. The selected alternative will be the basis for an amendment to the Lolo National Forest Land and Resource Management Plan (Forest Plan) and FEIS (USDA 1986).

Alternative C is the Preferred Alternative. Appendix I of this FEIS describes the proposed amendment to the Forest Plan.

The analysis of possible environmental and human effects of each alternative (including no action) is also documented here, in accordance with the format and content requirements for EIS's set forth in Federal regulations and the Forest Service Manual and Handbook (40 CFR 1500-1508, FSM 1950, and FSH 1909.15).

Need for Action.

The need for action is based on biological, political, and administrative considerations.

- Biologically, the presence of noxious weeds — as well as methods to control them — can have effects on both public and private resources, and on the human and natural environments. Those effects are introduced in the next few paragraphs, and are discussed in more detail in the Affected Environment and the Environmental Consequences chapters.

- Politically, social concern over the spread of several weeds has increased in recent years. Federal laws give the forest direction and authority for controlling noxious weeds in cooperation with local governments. Recent state laws in both Montana and Idaho underscore the increased awareness of noxious weeds and indicate growing political resolve to manage weeds. In both states, leadership for coordinating noxious weed management falls on county weed boards. These laws and county weed board plans are introduced below under the heading "Direction." Details can be found in Appendices A and B.

- Administratively, the Forest Plan recognized a need for weed management and research. The Plan set weed control targets, but the Plan FEIS provided no environmental analysis of impacts caused by weeds or weed control measures. Recent research now makes this analysis possible. This EIS will provide that analysis and will be the basis for a decision that will amend the Forest Plan regarding weed management.

Problem Statement.

Several noxious weeds are established and spreading on public and private lands on or near the Lolo National Forest (weed species of concern on the Lolo are listed Table I-1). These weeds can have negative impacts on both public and private resources. Types of areas that are potentially most affected by noxious weeds include domestic livestock rangelands, big game winter ranges, riparian areas, developed recreation sites, wildernesses, timber skid roads and landings, and roadsides.

Noxious weeds on rangelands, big game winter ranges, and riparian areas may compete with and replace native or desirable grasses and forbs, thereby reducing the forage productivity of those sites (due to the low palatability or poor nutritional value of noxious weeds). In developed recreation sites, weeds can affect the visual character of the site and can cause physical irritation to both people and animals (due to the spiny or coarse nature of many noxious weeds). In wilderness, noxious weeds disrupt natural ecological integrity and provide evidence of human presence and impact on the area. Roadsides and associated maintenance provide a seedbed and travelway for the spread of noxious weeds. Noxious weeds can compete with desirable plants seeded after road construction or other ground disturbing activity.

In all of the above site types, the presence of noxious weeds can provide a seed source for weed spread into new and adjacent areas. To some, noxious weeds present a visual intrusion on the landscape. Some people also see the presence of noxious weeds as an indication of poor land stewardship. Decreases in forage production for both wildlife and livestock, as well as reduced site quality for recreation, can have an economic impact across the region.

However, mere weed presence does not necessarily impact these resources. Much of the Lolo National Forest is not well suited for the establishment of noxious weed stands that dominate other vegetation. For instance, most of the weeds of concern here do poorly at high elevations, on northerly aspects in the moister habitat types, and on sites with closed or nearly closed forest or shrub canopies. Weed establishment and domination of other

plants generally requires a combination of factors including seed (or other regenerative part) introduction, disturbance activities, lack of shade, and specific weather conditions.

Scope.

The scope of the proposed action is limited to Lolo National Forest activities on lands under the forest's jurisdiction, including cooperative activities with adjacent landowners. Noxious weed infestations in western Montana extend to lands and activities well beyond this scope. The proposed action is not an attempt to "solve" the noxious weed problem in western Montana. This analysis will explore alternative ways for the Lolo – as a major land management agency and a neighbor to many other land owners – to manage noxious weeds.

The proposed action is a forest-wide program covering the next ten years, or until the Forest Plan is revised. This analysis examines the current weed situation on the Lolo, and estimates the maximum effects expected under each alternative. Actual effects would depend on how closely the sum of site-specific projects matches the total program levels estimated for each alternative.

The selected alternative will provide operational guidance for implementing site-specific projects. Each project will require individual environmental analysis tiered to this EIS. Depending on the scope and site-specific project factors, documentation of project-level environmental analysis will take one of the following three forms:

- ☐ a ***project file and decision memo*** (categorical exclusion);
- ☐ an ***environmental assessment*** (EA) leading to either a ***finding of no significant impact and decision notice*** or a decision to prepare a project-specific EIS;
- ☐ or an ***environmental impact statement*** (EIS) leading to a ***record of decision***.

This EIS does not directly deal with uses of herbicides for purposes other than noxious weed control – for instance, herbicide use for general lawn maintenance (general weeds as opposed to noxious weeds as defined later in this chapter). However, the analysis in this EIS may be incorporated by reference or otherwise used in environmental analysis of other proposals for herbicide use.

Direction.

Direction and authority for the proposed action comes from the National Forest Management Act (P.L. 94-588, NFMA), the National Environmental Policy Act (P.L. 91-190, NEPA), the Federal Land Policy and Management Act (P.L. 94-579, FLPMA), the Carlson-Foley Act (P.L. 90-583), and the Federal Noxious Weed Act (P.L. 93-629). NFMA, NEPA, and FLPMA provide general land management and environmental analysis direction. The Carlson-Foley Act allows the States to control noxious weeds on Federal lands, provided that: 1) the control program is approved by the Federal agency that administers the land, 2) the control methods are acceptable to the Federal agency, and 3) the same procedures are followed as would be applied to private land. The Carlson-Foley Act also authorized Federal agencies to reimburse the States for weed control expenses on Federal lands, provided that funds are specifically appropriated and are available for such purposes. The Federal Noxious Weed Act defined noxious weeds (see below) and authorized cooperative weed control agreements between Federal agencies and other agencies, organizations, or individuals.

In Montana, the Montana County Noxious Weed Management Act (7-22-2101 MCA) states that it is unlawful for any person to allow noxious weeds to propagate or go to seed on their land unless they have an approved weed management plan. This state law directs the counties to develop weed control districts to plan and implement

weed control efforts. It provides for the promulgation of rules to list statewide and district-specific noxious weeds. The state law also directs district (county) weed boards to: "make all reasonable efforts to develop and implement a noxious weed program covering all land within the district owned or administered by a federal agency" (7-22-2109(2)(c) MCA).

Idaho has a similar law and county weed control system.

As discussed in the Affected Environment chapter, the Lolo lies on nine Montana counties, and shares a border with another Montana country and three Idaho counties. Some counties have completed their weed control plans while others are still being drafted. One of the purposes of the proposed action is to coordinate the management of noxious weeds on the Lolo with the plans of the several weed control districts in a way that meets the land management needs for the Lolo and assists the counties in meeting their statutory requirements for developing weed control programs on Federal lands.

See Appendix A for the full text of the Carlson-Foley Act, the Federal Noxious Weed Act, and the Montana County Noxious Weed Management Act.

Previous Analysis.

In 1983, the Lolo National Forest prepared a situation analysis which addressed possible impacts of noxious weeds occurring within the national forest boundary (Spoon and others 1983). The 1986 Final Forest Plan recognized the need for further research on the ecology and control of noxious weeds in forest environments – most existing literature is based on agricultural and grassland ecosystems, while 98% of the Lolo National Forest consists of forest ecosystems. As a result, the Zone Ecologist conducted a review of several specific noxious weeds, and he presented recommendations for implementing a weed control program (Losensky 1987). The intent of that review was to provide the basis for developing reasonable species-specific management alternatives, and ensure a thorough review of non-herbicidal control methods.

Losensky's review covers the Lolo, Bitterroot, and Flathead National Forests. He identified nine current and evaluated five potential noxious weeds. The report examines the existing life-cycle and autecological literature for each species as it occurs in forest environments. It also reports field observations of weed effects on tree growth, and weed response to variable forest conditions (such as degree of shading, competition with other plants, ground disturbance, habitat type, aspect, etc.). Losensky also developed risk ratings, rate of spread models, and acre estimates for weed infestations. The data and recommendations in Losensky's report are fundamental to this analysis, so the report is incorporated by reference into this EIS.

Noxious Weed Definitions.

The term "noxious weed" has legal definitions established by both the State of Montana and the Federal Government. Noxious weed is defined in the Montana County Noxious Weed Management Act (7-22-2101 MCA) as:

> any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses and which is designated as a statewide noxious weed by rule of the department; or as a district noxious weed by a board, following public notice of intent and a public hearing.

In the Federal Noxious Weed Act (P.L. 93-629) a noxious weed is defined as:

> any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops,

other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish or wildlife resources of the United States or the public health.

Based on literature review, field observations, and review of State and County noxious weed lists (see Appendix B) Losensky (1987) evaluated fourteen species of noxious weeds on or near Lolo National Forest lands. These weeds can be divided into two categories — "established" and "potential." Established weeds are those that fit the above legal definitions, now occur on Lolo National Forest lands, and can cause significant impacts within forest environments. Potential weeds are those that fit the legal definitions, either do not currently occupy significant area within the Lolo's boundaries or have minimal impact within forest environments, but are nearby and may invade the Lolo or adjacent private lands in the near future. Table I-1 lists the weeds in each category on the Lolo.

TABLE I-1. Noxious Weed Species on the Lolo National Forest

ESTABLISHED	POTENTIAL
spotted knapweed *(Centaurea maculosa)*	**dyers woad** *(Isatis tinctoria)*
diffuse knapweed *(Centaurea diffusa)*	**white top** *(Cardaria draba)*
Canada thistle *(Cirsium arvense)*	**Russian knapweed** *(Centaurea repens)*
musk thistle *(Cardus nutans)*	**yellow starthistle** *(Centaurea solstitialis)*
goatweed *(Hypericum perforatum)*	**common crupina** *(Crupina vulgaris)*
houndstongue *(Cynoglossum officinale)*	**purple loosestrife** *(Lythrum salicaria)*
leafy spurge *(Euphorbia esula)*	
tansy *(Tanacetum vulgare)*[1]	
dalmatian toadflax *(Linaria dalmatica)*	

[1]Although common tansy is not now on State or county lists for noxious weeds, it was listed when the Lolo began to study the noxious weed problem in the staff paper prepared by Spoon and others (1983). Losensky (1987) also included tansy in his analysis. The interdisciplinary team retained it as an established noxious weed on the Lolo.

The current Lolo list makes three departures from Losensky's 1987 paper: common toadflax is omitted (the interdisciplinary team felt that it was not important on the forest), and common crupina and purple loosestrife are added to the potential category. The interdisciplinary team added purple loosestrife, based on its presence in Lake County and potential to affect wetlands, as reported by Mullin (1988).

Several of the weeds on state and county lists do not appear in the Lolo list in Table I-1. The interdisciplinary team determined, based on Losensky (1987) and professional judgment, that those species do not pose a significant threat to Lolo National Forest resources. Many of the state or county listed species that are omitted from the Lolo list are essentially limited to agricultural settings. There are a few agricultural special use permits on the Lolo, but their total land area is insignificant in terms of the total forest. Unique problems or weed management needs may occur in those or other special circumstances, but they will be addressed in the development or renewal of the special use permits, or will be assessed on a case-by-case basis.

The classification in Table I-1 is subject to change as new or existing species establish or vacate habitats on or near the Lolo National Forest. Reviews will be conducted according to the monitoring plan described in Appendix C.

Issues.

The following set of issues evolved over several interdisciplinary team meetings, and includes both public and Forest Service concerns. A list of tentative issues was mailed out to the Forest Plan mailing list and other potentially interested parties on November 23, 1987. Based on an analysis of public responses received by January 15, 1988, those issues were refined and eight were submitted to the Lolo Management Team. On February 10, 1988, the management team accepted those issues. Since then, additional public response and further analysis by the interdisciplinary team have resulted in the list of issues given below. The content analysis of responses to these issues is discussed in Chapter VI.

These issues guided the development of alternatives. Each issue is stated as a question, often general in nature, and is followed by specific objectives that tell how the issue was dealt with in the analysis process. A brief discussion of how the issue is addressed in this EIS is given after each objectives statement.

1. How are noxious weeds defined on the Lolo National Forest?

> ***Objectives:*** Clearly define what constitutes a noxious weed for the purposes of this EIS; categorize and list specific species; develop a policy for classifying and dealing with new invaders.

This issue is addressed above in the "Definitions" section. Noxious weed species are listed and categorized according to current status and ecological significance within forest environments on the Lolo National Forest. Future threats will be assessed during the monitoring review described in Appendix C.

2. What and how significant are the impacts of noxious weeds on forest resources — including native vegetation; threatened, endangered, or sensitive plants and animals; soils; water quality; aesthetics; wildlife and fish; and domestic livestock?

> ***Objectives:*** Define the problem in terms of affected resources.

In a general sense, this definition is provided above under the heading "Problem Statement." Details of the significance of effects on specific resources are provided in the Affected Environment and the Environmental Consequences (under the no action alternative) chapters. The significance of these effects was a major consideration in structuring the species-specific control objectives for each alternative.

3. Under what circumstances will the forest take weed control action to protect National Forest resources? How will sites be prioritized for treatment?

> ***Objectives:*** Develop a range of alternatives that base control actions on resource effects, weed ecology, and expected effectiveness; determine treatment priorities in terms of forest management objectives, weed threats, and control options.

Each alternative is structured around a basic management objective, which is translated into viable control objectives for each weed species. The species-specific objectives respond to resource impacts and expected effectiveness of available control methods. For instance, if an alternative prohibits the use of chemicals, then the most viable control objective for a certain species might be containment, even though eradication would be possible with chemical use. Resource effects and weed ecology are factored into the alternatives by recognizing that in certain situations, the effort to eradicate low levels of weeds may not be justified if resource impacts and threat of spread are minimal. See the Alternatives chapter for more discussion.

Treatment priorities are based on physical, biological, and administrative factors; and on risk assessments of weed spread and impact. Probability of successfully treating a given situation was also considered during priority development. Control priorities are discussed in the Alternative Development section of the Alternatives chapter.

4. What management objectives can be identified for each noxious weed species that affects or may affect the forest?

> ***Objectives:*** Structure alternatives in a way that is sensitive to the ecology, potential impacts, risk assessment, control options, and the probability of successfully achieving the control objective on a species by species basis.

As explained under the previous issue, these factors are evaluated in each alternative by individual species. In each alternative, species-specific control objectives and methods were developed accordingly. See the Alternatives chapter for discussion.

5. How can the forest work with other interested or affected parties – such as adjacent landowners, weed boards, government agencies, contractors, allotment permittees, or volunteer groups – to deal with shared aspects of the noxious weed situation?

> ***Objectives:*** Consider the effects of noxious weeds on adjacent landowners and determine the appropriate level of cooperative control agreements. Ensure that the forest's actions are responsive to state and local laws and plans. Establish standards and direction for informing the public about noxious weeds and for regulating the activities of forest users to minimize the spread of weeds.

This issue is addressed by including cooperative agreements with adjacent landowners as a minimum action alternative (B). Management standards which regulate the weed impacts of forest users are developed in Appendix D. State and local laws and regulations, as well as the weed management plans of counties and adjacent national forests, are discussed above under the heading "Direction," and in Appendices A & B. In-service training and public information activities will vary according to the objectives of each alternative (see the Alternatives chapter).

6. How can road construction, travel management, recreation management, range management, and other forest activities be adjusted to control the spread of noxious weeds?

> ***Objectives:*** Ensure that preventive measures are considered for all forest management activities.

Management requirements for minimizing or preventing noxious weed spread are developed in Appendix D. Many of these management standards are already being applied, and are included in all alternatives. Mitigation measures are discussed in the Alternatives and the Environmental Consequences chapters.

Some people have suggested that road construction is a major cause of weed spread, and that prevention should include a halt in road construction. A moratorium on road construction was considered but eliminated from detailed study, as discussed in the Alternatives chapter.

7. How would the weed management methods proposed in each alternative – including preventive, mechanical, biological, manual, and chemical methods – affect human health and the natural environment?

> ***Objectives:*** Ensure that the potential impacts of the weed management program in each alternative are thoroughly assessed. Develop risk management and mitigation measures.

The Environmental Consequences chapter covers this issue, drawing on details from appendices G and H. The effects of the various alternatives are compared in the Alternatives chapter. Mitigation is discussed in both chapters. See Appendix C for the Monitoring Plan, and Appendix D for management standards.

8. How can the forest cost-effectively manage noxious weeds under various budget constraints?

> ***Objectives:*** Consider economic costs and benefits of various control methods, and compare the relative costs of the alternative programs to current budget levels.

Comparative costs of control methods, along with expectations of success, were considered when matching the permitted control tools for each species to the general objective for each species. Overall cost of each alternative is compared to historic budget levels, as well as to the other alternatives. See the Alternatives chapter for the comparison, and Appendix F for the economic details for each alternative.

9. How will the forest collect data on the extent and spread of noxious weeds; how will it monitor the effects of weed management activities?

> ***Objectives:*** Develop procedures for collecting and maintaining data on weed situation and spread trends. Ensure that the impacts and effectiveness of weed control actions are monitored and periodically evaluated.

These elements are included in the monitoring plan found in Appendix C.

10. When chemical herbicides are considered viable control tools, which chemicals will be used?

> ***Objectives:*** Identify and list the appropriate herbicides on a species- and site-specific basis.

The Alternatives chapter discusses the selection of the most appropriate chemicals for given weed species and control objectives. Herbicide use is further limited by site factors as noted after the next issue.

11. How would chemical use be restricted; how would chemical accidents be handled?

> ***Objectives:*** Review, require, and follow established standards for herbicide application and for responding to accidents involving chemicals.

The use of chemicals considered in this EIS ranges from no herbicide application under alternatives A and D, through varying levels of application in the other alternatives. Aerial application of herbicides was eliminated from detailed study. See the Alternatives and Environmental Consequences chapters for further discussion.

Appendix D lists the management requirements that restrict where and under what conditions herbicide application would be allowed under any alternative. Each project would have a site-specific emergency spill plan, developed according to the guidelines in Appendix E.

12. How would sites be revegetated after noxious weed control actions?

> ***Objectives:*** Ensure that control actions are followed-up by appropriate vegetation management where needed to minimize the chance of weed re-establishment.

Management requirements include consideration of revegetation needs during project planning (Appendix D). Monitoring after control actions will include revegetation status and trend (Appendix C).

13. How can the forest support research into biological and other alternative weed control methods; how will noxious weed training and new information be disseminated to Forest Service employees, permittees, and contractors?

> ***Objectives:*** Determine how the forest can support research. Ensure that training and new information is timely and effectively transferred to decisionmaking and fieldgoing personnel involved in forest management activities and projects that can affect noxious weeds. Design information transfer programs that match the overall objectives of each alternative.

The Lolo can provide study sites to researchers working on biological or other new control methods. Funding of research activities varies among the alternatives considered. The forest will remain open to research proposals under all alternatives. Each proposal would be analyzed separately for environmental impacts.

As noted in the Alternatives chapter, training levels vary between alternatives according to the weed management goals for each alternative.

The alternatives are compared on the basis of each of these thirteen issues in pages II-36 and II-37.

CHAPTER II – ALTERNATIVES

Chapter II.

ALTERNATIVES

This chapter has five sections:

- **Alternative Development** – describes the process used to create the alternatives considered;
- **Alternatives Eliminated** – discusses alternatives that are not considered in detail;
- **Description of Alternatives** – describes the five alternatives analyzed in detail;
- **Comparison of Alternatives** – compares the five alternatives in terms of the issues presented in Chapter I and the environmental consequences presented in Chapter IV;
- **Mitigation** – discusses measures to mitigate impacts from the alternatives; and

ALTERNATIVE DEVELOPMENT.

The five alternatives presented later in this chapter were developed in response to the issues listed in the Purpose and Need chapter, the affected resources discussed in the Affected Environment chapter, and the individual weed species characteristics documented by Losensky (1987). The range of alternatives was designed to consider three primary issues: (1) deal only with weeds affecting private landowners versus dealing with weeds affecting both private and National Forest resources; (2) chemical versus no chemical weed control; and (3) a range of weed-control intensities.

This section explains the following aspects of the alternative development process:

- integrated pest management,
- control objectives,
- control priorities,
- control methods, and
- project examples.

Integrated Pest Management.

All alternatives (except A) are based on the integrated pest management approach (IPM). Three fundamentals of IPM are:

1) pest control methods should be based on an understanding of the pest's ecology,

2) pest control actions should balance the economic and environmental costs of control against the impacts inflicted by the pest (low pest population levels may be acceptable if the cost or impacts of control would exceed the pest damage),

3) a wide variety of control methods should be used to augment each other and prevent the pest from developing a resistance to a single technique. IPM requires carefully thought out management objectives that are supported by both economics and ecological factors. Under ideal circumstances, a wide spectrum of management techniques and control tools are used to deal with pests.

However, there is no standard definition of IPM – the term has different connotations for different people (for example, see the articles in NCAP 1989). Regulations implementing forest planning direction from the National Forest Management Act of 1976 (36 CFR 219.27 (3)) call for the use of IPM when dealing with forest insect pests. The Forest Service's internal handbook on Forest Pest Management (FSH 3409.11, 6/86) gives the following definition for IPM:

> A decisionmaking and action process incorporating biological, economic, and environmental evaluation of pest-host systems to manage pest populations.

While the NFMA regulations and the Forest Pest Management Handbook do not include noxious weeds in their definitions of "pest," the basic IPM concepts used in those sources are applicable here. Below is a modification of a proposed definition for "integrated nursery pest management" that seems appropriate for noxious weeds:

> Integrated pest management is the maintenance of noxious weed populations at tolerable levels by the planned use of a variety of preventive, suppressive, or regulatory methods that are economically efficient and socially acceptable. It is implicit that actions taken are the end-result of a decisionmaking process where weed populations and their impact on resources are considered, and control methods are analyzed for their effectiveness as well as their impact on economics, human health, and the environment.

Some people argue that any pest management program that does not consider the use of all available control tools (e.g., a program that prohibits the use of chemicals) should not be labelled "IPM." For this reason, none of the alternatives considered here use the IPM label, even though all but A fit the above definitions.

In this EIS, the mix of control tools and the intensity of application vary according to the overall and species-specific objectives for each alternative. Chemical herbicide use is minimized, but chemicals would be applied (except in the alternatives where chemical use is prohibited) when they are the most effective tool and have no unacceptable impacts on non-target organisms. A wide variety of non-chemical management tools is considered in the non-chemical action alternative.

Control Objectives.

Table II-1 gives definitions for control objective terms that are used later in this chapter to describe each alternative.

TABLE II-1. Control Objective Definitions

ERADICATE	Attempt to totally eliminate a noxious weed species from Lolo National Forest lands, recognizing that this may not actually be achieved during the analysis period. However, eradication efforts would continue as long as detectable levels of the weed were present on the forest.
SUPPRESS	Prevent seed production throughout the target patch and reduce the area coverage of the weed. Prevent the weed species from dominating the vegetation of the area, but accept low levels of the weed.
CONTAIN	Prevent the spread of the weed beyond the perimeter of patches or infestation areas established as of 1988. **TOLERATE** weeds within established infestations, but **SUPPRESS** or **ERADICATE** outside those areas.
TOLERATE	Accept the continued presence of established infestations and the probable spread to ecological limits for certain species. Try to exclude new invaders through preventive practices.

These objectives are *targets* that give direction for the intensity of control actions. Often it will not be possible to achieve 100 percent of the target. Still, such a target can be useful. For instance, a target of eradication provides for intense and sustained efforts to totally eliminate a given weed. Although it may be unrealistic to actually expect that this goal could be attained over a large area, using this target allows for more intense control efforts than would a target of suppression. In the latter case, some level of residual weed population would be acceptable; under the former, control efforts would not cease as long as any of the weed persisted in the control area.

Control Priorities.

The following list gives the general priority for weed control activities under all alternatives in this EIS. As financial and other resources become available for weed management, goals higher on the lists should be addressed before stepping down to the next goal. This priority is general, not species-specific. Within each alternative, priority is moderated by both overall and species-specific objectives of that alternative.

1) Support the establishment of a wide variety of biological control agents for each weed species. Ultimately, those weeds that are not eradicated should be kept in check at low densities by multiple biological enemies that would be self-perpetuating and would relieve the need for chemical and mechanical control efforts.

2) Prevent new invaders from becoming established on the forest. It is most effective to eradicate noxious weeds when they are new and occur in relatively small and isolated patches. The intensity of control action is also usually low at this point, often simply a matter of hand-pulling plants before they can go to seed. This approach requires that field going personnel be kept informed of new weed threats.

3) Contain established infestations. Keep weeds from spreading to new, unaffected areas.

4) Suppress existing infestations to reduce the effects of weeds on forest resources.

5) Eradicate established weed infestations.

Weed control projects should be focussed where they may have the greatest effect on preventing weed spread or damage to natural resources, and where they may have the greatest benefit to adjacent landowners who are actively trying to control weeds. The following three situations should receive the highest priority for weed control projects:

- areas that are now relatively free of weeds (including wilderness, trailheads, and unroaded areas);

- new infestations and small weed patches that threaten areas at high or moderate risk to weed invasion; and

- weeds on National Forest System land next to or near other ownerships where land managers have active weed control programs.

Control Methods.

Under the integrated pest management (IPM) approach, treatment need is determined by balancing potential injury to resources or management objectives against costs and impacts of control efforts. For instance, the presence of a single new noxious weed plant may threaten injury to either the site where it is found, or to adjacent sites if it is allowed to reproduce. Control by hand-pulling would be inexpensive, effective, and have minimal impact on the environment. On the other hand, a well established but isolated patch of another weed may pose

little threat of spread or injury to other resources. Control of this patch might require the use of a chemical herbicide, which could have adverse effects on a nearby aquatic environment. In this case, expected injury from the weed patch might not be high enough to justify the control action.

Once a need for treatment is determined, the most appropriate mix of control tools must be found. This requires careful consideration of relative costs and risks given the specific weed, environmental setting, and management objectives for the site. For this EIS, control tools are categorized into three indirect programs (prevention, biological, and information) and four direct methods (cultural, physical, biological, and chemical). The mix of these methods varies under the different alternatives, as outlined below in the "Description of Alternatives" section.

Indirect Methods. The three indirect programs involve activities that are more or less independent of individual weed or site conditions. The scope and intensity of these programs varies according to the overall objective of each alternative.

- ☐ ***Prevention Program.*** Preventive measures overlap with many forest management activities. They require an understanding of how weeds become established and spread, along with a willingness to modify many types of activities. Prevention measures common to all alternatives are discussed later in this chapter (Mitigation section), and are listed in Appendix D.

- ☐ ***Biological Program.*** The biological program involves cooperative and cost-share agreements with other agencies that are conducting research on biotic noxious weed control agents. This is different from direct releases of biotic agent as described below in the direct control methods. The level of funding passed on to these research efforts varies according to the overall objectives for each alternative.

- ☐ ***Information Program.*** The goals of informational activities are to increase awareness of the noxious weed situation, pass on the latest research and understanding of weed impacts and ecology, and provide training in the most appropriate preventive and direct control methods. Programs can include in-service instruction on weed recognition and control techniques, public displays and brochures, and inclusion of noxious weed issues as an element of environmental education. County weed boards, extension services, and state agriculture departments can take the lead in general public information activities. The Lolo National Forest can include noxious weed materials in its efforts to inform and involve forest users and the public in forest management issues.

Direct Methods. Direct weed control methods are dependent on species, site factors, and management objectives. The following methods are general ideas, and some may be more applicable to agricultural situations than to forest settings. These methods represent the types of activities that were considered when the species-specific methods listed for each alternative were developed.

- ☐ ***Cultural.*** Included in this category are activities that purposefully enhance the growth of desired vegetation. Since noxious weeds are typically opportunistic pioneers of open sites, any practice that favors the retention or introduction of desirable plants that can dominate or out-compete weeds can serve as a control on noxious weeds. Examples are seeding, planting, fertilizing, irrigating, retaining brush and tree canopy cover, and managing grazing to favor later rather than early successional stages. Prescribed fire designed to stimulate desired vegetation could also fit in this category.

  Cultural methods are not considered treatment tools in the alternatives analyzed. Instead, they are adjuncts to the following three control methods, and are incorporated where feasible in the prevention and mitigation measures discussed in Appendix D.

- ☐ ***Physical.*** Manual and mechanical methods of physically destroying noxious weeds or interfering with their reproduction would be included here. For example, hand-pulling, digging, or cutting weeds with hand tools can kill plants or prevent them from going to seed. Using machines to till an infested area, or to mow or

smother weeds can have the same effect. Under the proper conditions, prescribed fire can also kill weeds or destroy their seeds; on the other hand, fire can sometimes provide a seed bed for weeds or can be more detrimental to desired vegetation than to weed plants.

Only two physical methods are considered in this EIS: grubbing/pulling plants by hand, and mowing/topping plants with hand tools or power weed and brushcutting tools. Due to the typically rough terrain and scattered nature of weed infestations on the forest, both methods would generally be accomplished with hand-held tools. Roadsides, administrative sites, and developed recreation sites might be mowed with tractors.

Table II-2 shows the ratio and frequency of expected use of these methods on each weed. The "percent" column indicates for each species the ratio of treatments that would be grubbed or pulled versus mowing or topping. For instance, small, new infestations may be effectively controlled by pulling plants, but this method is impractical on extensive infestations; therefore most species would be treated predominately by mowing or topping when physical treatment is prescribed. New invaders should be relatively easy to treat with grubbing or pulling. Leafy spurge is not effectively treated with either method. The frequency columns show the number of times that a treatment on a given site would have to be repeated during the decade to effectively control the weed.

TABLE II-2. Physical Method Ratios and Application Frequency (years per decade)

	GRUB/PULL		MOW/TOP	
SPECIES	Percent[1]	Frequency[2]	Percent[1]	Frequency[2]
Spotted knapweed	5%	10	95%	10
Diffuse knapweed	5%	10	95%	10
Canada thistle	5%	5	95%	5
Musk thistle	5%	5	95%	5
Goatweed	0%	0	0%	0
Houndstongue	5%	3	95%	3
Leafy spurge	0%	0	0%	0
Tansy	25%	5	75%	10
Dalmatian toadflax	100%	10	0%	0
NEW INVADERS	100%	2	0%	0

[1]"Percent" = expected use of one method relative to the other.
[2]"Frequency" = number of years in a decade that a given site would have to be treated for effective control.

☐ ***Biological.*** Any biotic agent that directly attacks a weed and reduces its competitive or reproductive capacities can be considered a biological control method. Examples include plant pathogens such as fungi that attack roots or insects that eat seeds. Selective grazing with goats and sheep can reduce the vigor and seed production of some weeds. Several new biological control methods are under research and development. These techniques may effectively contain or suppress some noxious weeds, but none can be expected to eradicate any of the listed weeds. Currently available biotic agents are reviewed in Losensky (1987) and Monnig (1987).

Several biological control agents have been or are continuing to be released throughout the region by other Federal and State agencies. For instances, insects that attack knapweeds are well-dispersed. The USDA Animal and Plant Health Inspection Service (APHIS) screens new biological agents for impacts on agricultural and rare plants. APHIS also prepares environmental assessments on the possible impacts of releasing those agents.

Since these releases and environmental assessments are ongoing actions of other agencies and will continue regardless of the Lolo National Forest's weed management, they will not be examined here. However, three biotic agents are considered here as direct control methods in some alternatives: 1) the seed head weevil (*Rhinocyllus conicus*) for musk thistle, 2) the defoliating beetle (*Chrysolina quadrigemina*) for goatweed, and 3) goats to graze leafy spurge. The frequency column in Table II-3 shows the number of years in the decade that each of these control methods would have to be repeated for a site.

TABLE II-3. Biological Methods and Application Frequency (years per decade)

SPECIES	AGENT	Frequency[1]
Musk thistle	Weevil	3
Goatweed	Beetle	3
Leafy spurge	Goats	10

[1]"Frequency" = number of years in a decade that a given site would have to be treated for effective control.

☐ ***Chemical.*** Chemical control of the identified noxious weeds can be accomplished with varying degrees of success through the use of three herbicides: picloram, 2,4-D, and glyphosate. (In this EIS, herbicides are referred to by their generic chemical name.) See Appendix H for a thorough discussion of these chemicals.

■ **Picloram** is commonly known by the trade name **Tordon®**. Picloram is a restricted-use pesticide (can only be used by certified applicators) labeled for non-cropland forestry, rangeland, right-of-way, and roadside weed control. Picloram acts on broadleaf plants as a growth regulator, absorbed through leaves and root uptake. It is easily translocated in plants and accumulates in new growth causing leaves to cup and curl. Picloram is water soluble and can move in sandy soils low in organic matter. It may affect nearby desirable plants that have roots growing into a treated area. Degradation by soil micro-organisms is slow and primary breakdown is by ultra-violet light. Picloram is relatively persistent (can effectively control many weeds for three years following one application), but persistence varies by soil type and weather. It is restricted from use near surface or ground water.

■ **2,4-D** is labeled for a wide variety of uses, and is an active ingredient in many products offered by several manufacturers, many marketed for home-use. It acts on broadleaf plants as a growth regulating hormone absorbed by leaves, stems, and roots. It moves throughout a plant and accumulates in growing tips. Salts of 2,4-D can move in sandy soils. 2,4-D is less persistent than picloram (soil micro-organisms break it down in a matter of weeks so annual application is required), but can be used closer to water.

■ **Glyphosate** is marketed as **Roundup®**, **Rodeo®** and **Accord®**. Glyphosate is also labeled for a wide variety of uses, including home-use. It is readily absorbed by leaves and disrupts the photosynthetic process. It affects a wide variety of plants, including grasses and other non-broadleafs. Glyphosate binds readily to organic matter in soil, and is readily degraded by micro-organisms. Soil movement is very slight.

The **Rodeo®** and **Accord®** formulations (without the surfactant in **Roundup®**) can be used near or even in water.

If new chemicals become available after this EIS is completed, the forest will evaluate them and determine whether or not they should be considered for use on the Lolo. Before any new chemical could be used, further environmental analysis and documentation would be required.

Table II-4 shows which chemicals are considered here for each weed species (for those alternatives that do not prohibit the use of chemicals). The table also gives the reference sources used to identify the listed chemicals as the most effective herbicides for treating the given weed.

TABLE II-4. Chemicals Considered & References for Herbicide Control of Each Weed Species

SPECIES	HERBICIDES	REFERENCES
Spotted knapweed	Picloram, 2,4-D & Glyphosate	Hickman & Lym, 1985; Lacey & Lacey, 1985; Klingman, & others, 1983
Diffuse knapweed	Picloram & 2,4-D	Lacey & Lacey, 1985
Canada thistle	Non-chemical only	Losensky, 1987
Musk thistle	Non-chemical only	Losensky, 1987
Goatweed	Picloram & 2,4-D	Lacey & Lacey 1985
Houndstongue	Picloram & 2,4-D	Lacey & Lacey, 1985; Klingman & others, 1983
Leafy spurge	Picloram, 2,4-D & Glyphosate	Lym & Messersmith, 1985a, 1985b; Klingman & others, 1983
Tansy	Picloram, 2,4-D & Glyphosate	Lacey & Lacey, 1985, Klingman & others, 1983
Dalmatian toadflax	Picloram	Lacey & Lacey, 1985
NEW INVADERS	Picloram, 2,4-D & Glyphosate	Lacey & Lacey, 1985; Klingman & others, 1983

Herbicides are applied in formulations that include active ingredients (in this case the generic chemical name) and a variety of inert ingredients such as carriers and surfactants. Risk assessments and label restrictions are based on the application-ready formulation which includes both active and inert ingredients. For instance, the Roundup® formulation of glyphosate contains a surfactant that is more toxic to aquatic organisms than is the active ingredient, and therefore the label is very restrictive regarding the use of Roundup® near water. Rodeo®, on the other hand, is a glyphosate formulation without the surfactant found in Roundup® and is registered for use in aquatic environments.

Picloram is generally more persistent (requiring fewer repeat applications), more effective against target weeds, and less likely to affect nontarget plants than the other two herbicides. It is generally the chemical of choice, except near surface or ground water. In areas near but not immediately adjacent to water (where picloram would be restricted), 2,4-D would be used (if effective on the target weed). In cases too close to water to use either picloram or 2,4-D, a glyphosate formulation without the surfactant would be used.

Table II-5 shows the application rates assumed for these three herbicides in this EIS.

TABLE II-5. Chemical Application Rates
(active ingredient)

CHEMICAL	gal/ac	lbs/gal	lbs/ac
Picloram (Tordon®)	0.25	2.00	0.50
2,4-D	0.50	4.00	2.00
Glyphosate (Rodeo®)	0.75	5.40	4.05

For this EIS, application methods are limited to spot spraying with backpack pumps, or spot or broadcast spraying from truck mounted boom sprayers or hand-held hose nozzles. Aerial application was eliminated from consideration for reasons discussed below in the "Alternatives Eliminated" section.

Table II-6 shows the ratio of expected use of the three chemicals for each weed. The ratios are based on the habitat types, soil types, and proximity to water where each weed is expected to cause infestation. For example, tansy occurs largely in moist habitats or near water (where glyphosate might often be the only chemical allowed under these alternatives), while dalmatian toadflax occurs in dry sites (where picloram would likely be used most often). The frequency column shows the number of years in the decade that a site would have to be treated to achieve effective control.

TABLE II-6. Chemical Method Ratios and Application Frequency (years per decade)

SPECIES	PICLORAM		2,4-D		GLYPHOSATE	
	Percent[1]	Frequency[2]	Percent[1]	Frequency[2]	Percent[1]	Frequency[2]
Spotted knapweed	75%	3	20%	7	5%	7
Diffuse knapweed	70%	3	25%	7	5%	7
Canada thistle	70%	3	20%	5	10%	5
Musk thistle	0%	0	0%	0	0%	0
Goatweed	70%	3	20%	7	10%	7
Houndstongue	70%	3	25%	3	5%	3
Leafy spurge	75%	3	20%	10	5%	10
Tansy	5%	3	45%	7	50%	7
Dalmatian toadflax	100%	3	0%	0	0%	0
NEW INVADERS	65%	3	20%	10	15%	10

[1]"Percent" = expected use of one chemical relative to the others.
[2]"Frequency" = number of years in a decade that a given site would have to be treated for effective control.

Project Examples.

It is not possible to describe actual weed control projects until site-specific analyses are done. If alternative B, C, or E is chosen, then herbicide projects could range from spraying individual weed clumps spread over less than a quarter of an acre with a backpack sprayer, to spraying several miles of road right-of-way with a truck-mounted boom sprayer. Monnig (1988) developed model spray projects to evaluate human health risk. Here are four of those models to illustrate the range of projects types that would be possible under alternatives B, C, or E.

Small Project. Herbicide is applied to one net acre of target weeds within a 10-acre project area. Two workers with backpack sprayers might cover such a project in two hours.

Mid-sized Project. Herbicide is applied to 40 net acres of target weeds within a 200-acre project area. Four workers with backpack sprayers might complete the project in six working days.

Large Project. Herbicide is applied to 500 acres with truck-mounted equipment (boom sprayers and/or hand-held nozzles). Backpack sprayers would be used along edges and in terrain too rough for trucks.

Right-of-Way and Riparian Projects. Truck-mounted boom sprayers can cover a swath about 12 feet wide. If roadsides or riparian areas are accessible to trucks, these boom sprayers may cover a 20-foot right-of-way in one pass. If not accessible, the area can be treated with backpack sprayers or hand-held nozzles and hoses mounted on a truck.

Projects on the Lolo would most likely be in the small to mid-sized range, or would fit the right-of-way example.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY.

The three alternatives discussed below were eliminated from detailed study.

Aerial Application of Herbicides.

Broadcast spraying of chemicals from aircraft is a controversial topic that can be emotionally highly charged. Most of the noxious weed situations on the Lolo National Forest can be treated more effectively with backpack or truck-mounted spray equipment. Most of the weed situations on the Lolo involve sites with shrub and tree canopies that make ground application more practical and effective than aerial application.

No New Road Construction.

A complete halt in the forest's road construction activities was considered an unreasonable alternative. Assessing the effects of such an alternative on the whole range of forest resources and programs would require a massive analysis on the scale of a forest plan. Past road construction and associated activities have contributed to the spread of noxious weeds, but today's improved awareness and understanding of weeds allows for better prevention or mitigation through careful design and management practices. Most of the noxious weed impacts occur in lower elevations on drier, more open sites and near property boundaries where weeds might spread to affect a neighbor's land. Most of the new road construction on the forest will occur in higher elevation, moist sites, with dense canopy cover where noxious weed impacts are often slight or nonexistent. New

forest standards and management requirements will be added to the Forest Plan to ensure that the potential spread of noxious weeds is considered and mitigated in all future road construction (see Appendix D). Any decision not to build a road based on noxious weed impacts must be made on a case-by-case rather than a programmatic basis.

Restoration of Natural Ecosystems and Plant Communities Forest-Wide.

This alternative would have required treatment methods which would have resulted in a contradiction of the stated goal. The methods necessary to completely eradicate noxious weeds forest-wide would cause serious impacts on natural plant communities. This alternative was eliminated because of this contradiction. Also, our current plant communities include many non-native plants that are not noxious weeds. In modified environments like this, natural plant communities are very hard to define and probably impossible to recreate. Instead of this alternative, Alternative E was developed as an aggressive attempt to eradicate or suppress noxious weeds.

DESCRIPTION OF ALTERNATIVES.

The alternatives considered in detail are designed as programmatic guidelines and projections – they do not include specific projects. Site-specific project analysis and documentation will be conducted as outlined on page I-3.

Treatment and impact levels for each alternative program are estimated assuming full funding and implementation. This programmatic approach allows us to analyze the upper-bounds of effects that could result from each program. The treatment acreage estimates are based on the sum of projects expected across the forest in any given year of the decade. Environmental effects of these alternatives are evaluated at this upper-bound level, even though in some years the sum of all projects may be lower. Each year, projects planned at the district level will be reviewed in sum to be sure that cumulative effects would fall within those analyzed in this EIS. The alternatives are:

Alternative A *no action* – continue current direction; attempt to prevent establishment of new weed species while tolerating those weeds already present. Support biological controls, employ limited physical control and no chemicals.

Alternative B control weeds that affect adjacent landowners who have active weed management programs coordinated through a county weed board.

Alternative C *Preferred Alternative* – control weeds that affect national forest resources or adjacent landowners who have active weed management programs.

Alternative D control weeds that affect national forest resources or adjacent landowners who have active weed management programs, but do not use chemical herbicides.

Alternative E attempt to eradicate or suppress all noxious weeds on the forest.

ALTERNATIVE A *(No Action).*

Objective: Continue current direction; prevent establishment of new weed species while tolerating those weeds already present on the forest. Support biological controls, employ limited physical control, and do not use chemical herbicides.

This alternative meets the requirements for including a "no action" alternative in the analysis process, as specified in the Forest Service Handbook 1909.15, section 23.1. The levels of control activity and weed infestations represented by this alternative serve as baselines for comparing the other alternatives.

While current direction recognizes that noxious weeds have negative impacts, weeds are expected to continue to spread to certain biological limits. This alternative supports the release of biological controls agents by other agencies, and employs limited physical control actions to contain or suppress some special instances of weeds. Chemical herbicides are not used under this alternative. Further research into weed ecology and biological control agents would be supported in a limited scope. Several preventive measures will be taken to avoid the establishment of new noxious weeds or the introduction of existing noxious weeds into currently unaffected areas.

Indirect Actions:

Information: No public information program. In-service training limited to updates on research and potential new invaders.

Biological Program: No funding has been provided in recent years for research and development of biological control techniques.

Prevention: Adhere to the standards, guidelines, and management requirements listed in Appendix D.

Inventory: Only track new invaders, as encountered by field going personnel performing other duties.

Species Control Objectives:

Prevent or **eradicate** any new invaders.

Tolerate all nine existing species while seeking long-term biological controls.

Direct Weed Control:

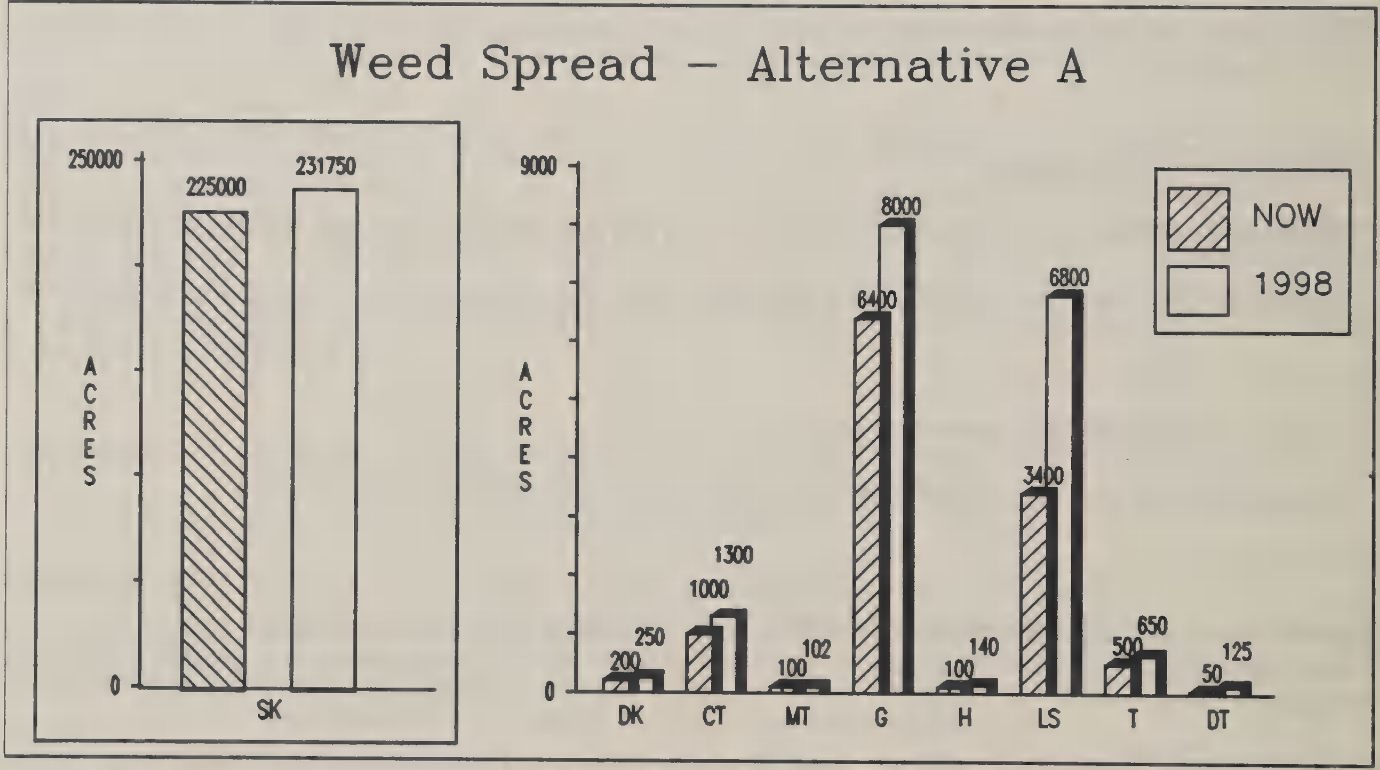
Expected weed acreages and treatment activities under Alternative A are shown in Figure II-1a and Table II-7a. Since spotted knapweed already occurs at much higher levels than any other weed, it is graphed separately in Figure II-1a.

Table II-7a shows current and projected weed infestation acreages, based on the control activities projected under this alternative. Since this is the no action alternative, virtually no control activities are planned. The 1998 projections are based on the current acres and spread rate estimates displayed in the Affected Environment chapter.

TABLE II-7a. Control Acres (per decade) and 1998 Weed Projections – Alternative A

WEED SPECIES	PHYSICAL CONTROL	BIOLOGICAL CONTROL[1]	CHEMICAL CONTROL	TOTAL TREATED	1998 INFESTED	89-98 CHANGE	% CHANGE 89-98
Spotted knapweed	0	0	0	0	231,750	6,750	3%
Diffuse knapweed	0	0	0	0	250	50	25%
Canada thistle	0	0	0	0	1,300	300	30%
Musk thistle	0	0	0	0	102	2	2%
Goatweed	0	0	0	0	8,000	1,600	25%
Houndstongue	0	0	0	0	140	40	40%
Leafy spurge	0	0	0	0	6,800	3,400	100%
Tansy	0	0	0	0	650	150	30%
Dalmatian toadflax	0	0	0	0	125	75	150%
NEW INVADERS	5	0	0	5	0	0	0%
TOTAL ACRES	5	0	0	5	249,117	12,367	5.2%

[1]Does **not** include the indirect biological program which is measured in dollars rather than acres.



NOTE: the vertical axis is scaled at 0-250,000 acres for spotted knapweed, while the vertical axis for the other weeds is scaled at 0-9,000 acres. If both graphs were plotted at the same scale, the spotted knapweed graph would be 28 times higher than the other graph.

FIGURE II-1a. Current and Projected 1998 Infestation Estimates by Weed Species -- Alternative A

ALTERNATIVE B

Objective: Control weeds that affect adjacent landowners who have active weed management programs coordinated through a county weed board. Enter into cooperative agreements with these landowners. Inside these cooperative areas, use physical, biological, and chemical methods to eradicate, suppress, or contain weeds in conjunction with agreement objectives. Outside these areas, tolerate existing weeds and try to prevent the establishment of new invaders.

This alternative is a minimum action that is responsive to community and off-forest weed impacts. Co-op agreement activities would be in addition to the biological, physical, and prevention activities outlined under Alternative A. Adjacent landowners' efforts to control weeds on their property would be supported.

The focus of this alternative is to reduce the ***agricultural*** impacts of weeds. There may be special cases where national forest land is managed for agricultural purposes (for instance, the hay pastures at the Ninemile Remount Depot). Those special agricultural cases might be treated for weeds under this alternative, even if no adjacent landowners are involved in the weed control project. Non-agriclutural resource impacts on national forest land would not be dealt with directly under this alternative.

Indirect Actions:

Information: No public information program. In-service training limited to updates on research and potential new invaders.

Biological Program: Provide about $7,000 a year to research and development of biological control techniques.

Prevention: Adhere to the standards, guidelines, and management requirements listed in Appendix D

Inventory: Track new invaders only as encountered by field going personnel performing other duties. For areas under cooperative agreements, thoroughly map the location, density, and trend of all noxious weed species included in the co-op agreements. Estimated inventory program cost for this alternative is $5,000.

Species Control Objectives:

Prevent or **eradicate** any new invaders.

Suppress *spotted knapweed, diffuse knapweed, goatweed, houndstongue, leafy spurge, tansy,* and ***dalmatian toadflax*** in Co-op areas – **Tolerate** while seeking long-term biological controls elsewhere.

Contain *Canada thistle* in Co-op areas – **Tolerate** while seeking long-term biological control elsewhere.

Tolerate *musk thistle* while seeking long-term biological controls.

Direct Weed Control:

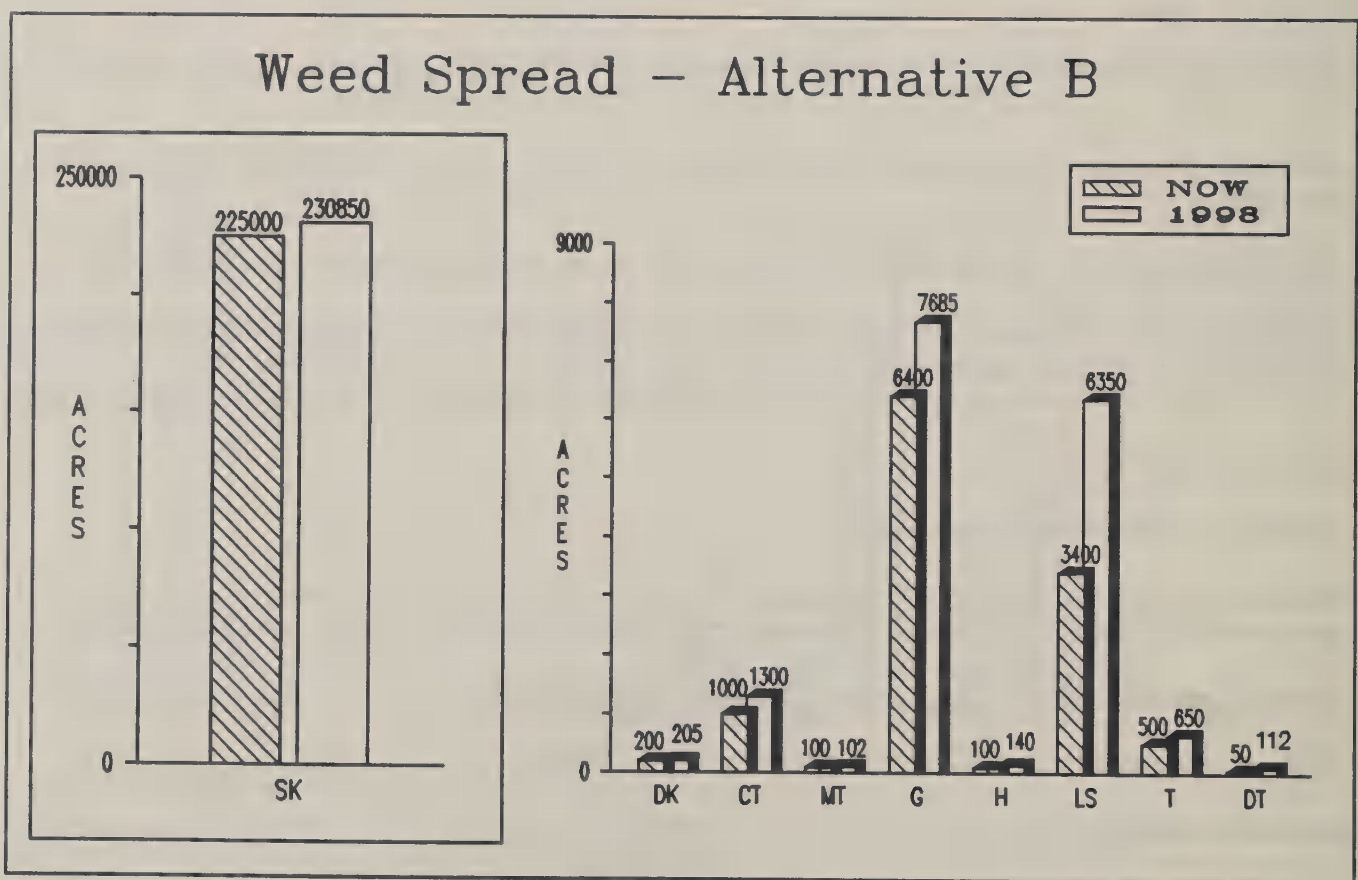
Expected weed acreages and treatment activities under Alternative B are shown in Figure II-1b, Table II-7b, and Figure II-2b. Since spotted knapweed already occurs at much higher levels than any other weed, it is graphed separately in Figure II-1b.

Table II-7b shows current and projected weed infestation acreages, based on the control activities projected under this alternative. The 1998 projections are based on the current acres and spread rate estimates displayed in the Affected Environment chapter.

TABLE II-7b. Control Acres (per decade) and 1998 Weed Projections – Alternative B

WEED SPECIES	PHYSICAL CONTROL	BIOLOGICAL CONTROL[1]	CHEMICAL CONTROL	TOTAL TREATED	1998 INFESTED	89-98 CHANGE	% CHANGE 89-98
Spotted knapweed	0	0	1,000	1,000	230,850	5,850	3%
Diffuse knapweed	0	0	50	50	205	5	2%
Canada thistle	0	0	0	0	1,300	300	30%
Musk thistle	0	0	0	102	2	2	2%
Goatweed	0	0	350	350	7,685	1,285	20%
Houndstongue	0	0	0	0	140	40	40%
Leafy spurge	0	0	500	500	6,350	2,950	87%
Tansy	0	0	0	0	650	150	30%
Dalmatian toadflax	0	0	15	15	112	62	123%
NEW INVADERS	1	0	4	5	0	0	0%
TOTAL ACRES	1	0	1,919	1,920	247,394	10,644	4%

[1]Does **not** include the indirect biological program which is measured in dollars rather than acres.



NOTE: the vertical axis is scaled at 0-250,000 acres for spotted knapweed, while the vertical axis for the other weeds is scaled at 0-9,000 acres. If both graphs were plotted at the same scale, the spotted knapweed graph would be 28 times higher than the other graph.

FIGURE II-1b. Current and Projected 1998 Infestation Estimates by Weed Species – Alternative B

Annual Control Treatment Acres:

Since most control methods would have to be re-applied to a treated site several times during a decade, average annual treated acres would be more than one tenth the acres listed above. The control acres shown above in Table II-7b indicate what would be treated during the decade, but not how often treatment would be repeated. In order to determine the average annual acres treated, those numbers must be adjusted by the repeat application frequencies discussed earlier in the "Control Methods" section (see Tables II-2, II-3, and II-6). Figure II-2b illustrates the estimated ***annual average*** level of control activities that would occur under this alternative. These are relative, upper-bound estimates for comparison purposes – they should not be interpreted as firm numbers.

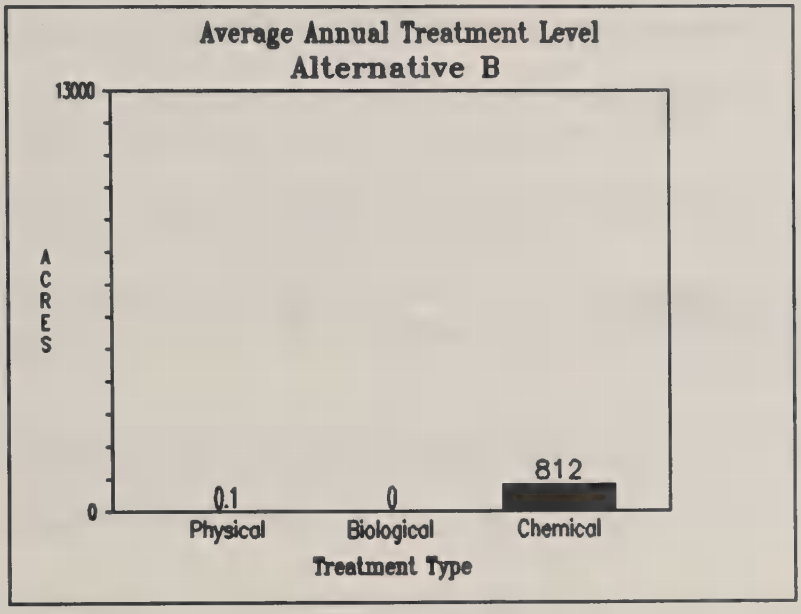


Figure II-2b. Average Annual Acres Treated with Physical, Biological, and Chemical Methods – Alternative B

ALTERNATIVE C *(Preferred)*

Objective: Control weeds that affect national forest resources or adjacent landowners who have active weed management programs coordinated through a county weed board. Emphasize cost-effective and practical treatments, based on expected resource impacts and effectiveness of control methods. Use physical, biological, or chemical methods to eradicate, suppress, or contain existing noxious weeds where they may have significant impacts; tolerate where impacts are insignificant. Prevent or eradicate new invaders.

This alternative responds to both on-forest resource impacts, and to community and off-forest weed impacts. Where forest resources are affected by noxious weeds, cost-effective and environmentally sound control methods would be integrated with management practices designed to prevent weed spread. Adjacent landowners' efforts to control weeds on their property would be supported, and the local political concern for weed control planning would be addressed. All available control methods would be considered, including further research into weed ecology and biological control agents. Several preventive measures would be taken to avoid the establishment of new noxious weeds or the introduction of existing noxious weeds into currently unaffected areas.

Indirect Actions:

Information: ■ Public inform and involve program – prepare a brochure for distribution at offices and visitor centers, aimed at increasing public awareness of weed problems, recognition of weed species, understanding of forest weed control activities, and ways that forest users and volunteer groups can assist in prevention and control. Include information on noxious weed situations and control activities in published reports, mailings, and environmental education activities. ■ In-service training – circulate updates on research, control methods, preventive practices, and potential new invaders. Schedule training workshops for field going personnel.

Estimated information program cost for this alternative is $2,000 for brochure design and printing.

Biological Program: Provide about $10,000 a year to research and development of biological control techniques.

Prevention: Adhere to the standards, guidelines, and management requirements listed in Appendix D.

Inventory: Begin a systematic, sample-based program to inventory existing weeds, only on sites that are at (or adjacent to) high risk of resource impacts from weeds. Spot check sites likely to be affected by new invaders, and track them as encountered by field going personnel performing other duties. For areas under cooperative agreements, thoroughly map the location, density, and trend of all noxious weed species included in the co-op agreements.

Estimated inventory program cost for this alternative is $10,000.

Species Control Objectives:

Prevent or **eradicate** any new invaders.

Eradicate musk thistle across the forest (limited acreage and effective control is available).

Eradicate tansy in new infestations and roadsides (where treatment is relatively easy and effective) – **Contain** established stands elsewhere.

Suppress diffuse knapweed, houndstongue, and dalmatian toadflax across the forest (limited acreage and control effectiveness is moderate).

Suppress spotted knapweed, goatweed, and new infestations of leafy spurge in Co-op areas and the Special Management Areas listed in Table III-2 – **Contain** elsewhere (action is concentrated on high impact areas because infestation acreages are extensive and available control effectiveness is moderate).

Contain Canada thistle in Co-op areas and Special Management Areas (Table III-2) – **Tolerate** while seeking long-term biological control elsewhere (low impact species that tends not to persist in the absence of ground disturbing activity).

Direct Weed Control:

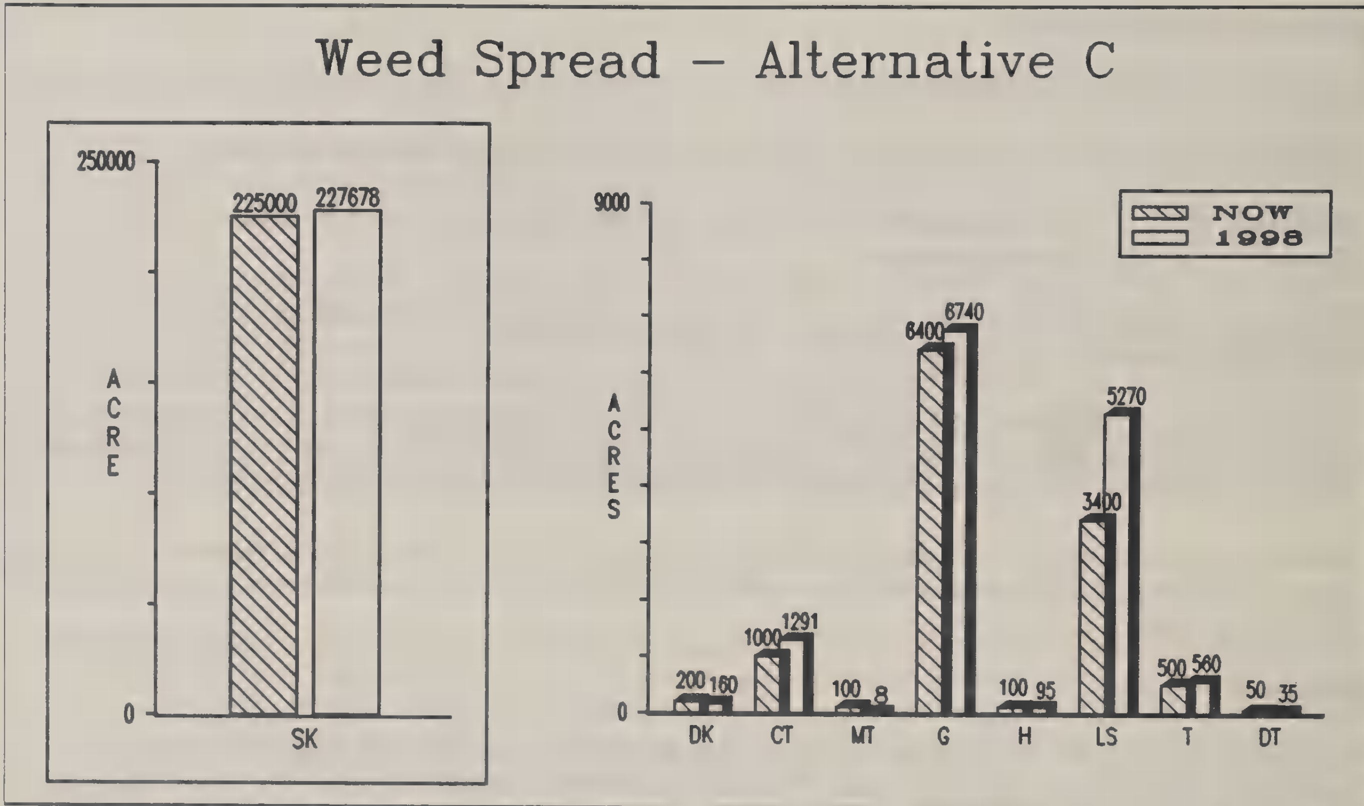
Expected weed acreages and treatment activities under Alternative C are shown in Figure II-1c, Table II-7c, and Figure II-2c. Since spotted knapweed already occurs at much higher levels than any other weed, it is graphed separately in Figure II-1c.

Table II-7c shows current and projected weed infestation acreages, based on the control activities projected under this alternative. The 1998 projections are based on the current acres and spread rate estimates displayed in the Affected Environment chapter.

TABLE II-7c. Control Acres (per decade) and 1998 Weed Projections – Alternative C

WEED SPECIES	PHYSICAL CONTROL	BIOLOGICAL CONTROL[1]	CHEMICAL CONTROL	TOTAL TREATED	1998 INFESTED	89-98 CHANGE	% CHANGE 89-98
Spotted knapweed	0	0	4,525	4,525	227,678	2,678	1%
Diffuse knapweed	0	0	100	100	160	-40	-20%
Canada thistle	0	0	10	10	1,291	291	29%
Musk thistle	5	100	0	105	8	-92	-92%
Goatweed	0	1,050	350	1,400	7,740	340	5%
Houndstongue	25	0	25	50	95	-5	-5%
Leafy spurge	0	250	1,450	1,700	5,270	1,870	55%
Tansy	50	0	50	100	560	60	12%
Dalmatian toadflax	50	0	50	100	35	-15	-30%
NEW INVADERS	2	0	3	5	0	0	0%
TOTAL ACRES	132	1,400	6,563	8,095	241,836	5,086	2%

[1]Does **not** include the indirect biological program which is measured in dollars rather than acres.



NOTE: the vertical axis is scaled at 0-250,000 acres for spotted knapweed, while the vertical axis for the other weeds is scaled at 0-9,000 acres. If both graphs were plotted at the same scale, the spotted knapweed graph would be 28 times higher than the other graph.

FIGURE II-1c. Current and Projected 1998 Infestation Estimates by Weed Species – Alternative C

Annual Control Treatment Acres:

Since most control methods would have to be re-applied to a treated site several times during a decade, average annual treated acres would be more than one tenth the acres listed above. The control acres shown above in Table II-7c indicate what would be treated during the decade, but not how often treatment would be repeated. In order to determine the average annual acres treated, those numbers must be adjusted by the repeat application frequencies discussed earlier in the "Control Methods" section (see Tables II-2, II-3, and II-6). Figure II-2c illustrates the estimated ***annual average*** level of control activities that would occur under this alternative. These are relative, upper-bound estimates for comparison purposes – they should not be interpreted as firm numbers.

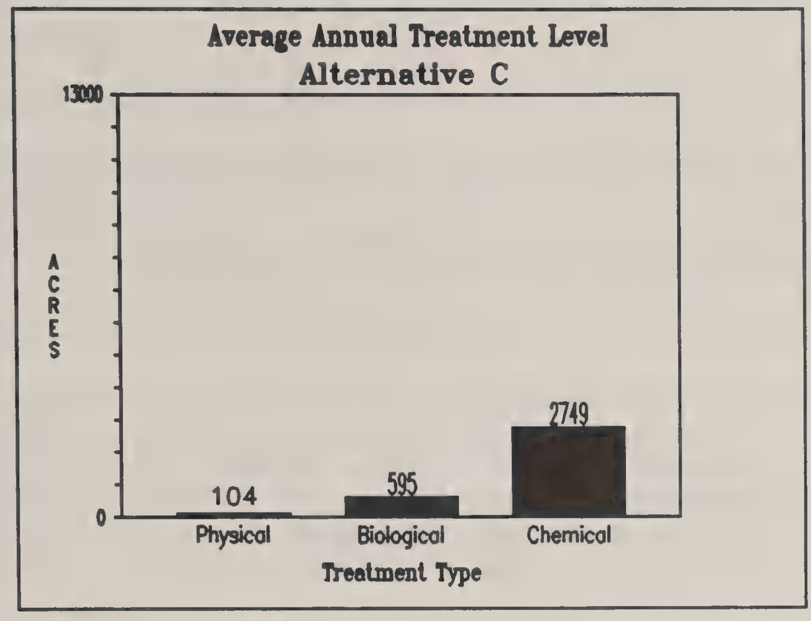


Figure II-2c. Average Annual Acres Treated with Physical, Biological, and Chemical Methods – Alternative C

ALTERNATIVE D

Objective: Same as Alternative C, except that chemical herbicides would not be used.

This alternative responds to concerns over the need for and effects of chemical use. Species-specific control objectives from Alternative C are adjusted to ensure that objectives are reasonably obtainable with the given control methods. Comparing this alternative with Alternative C will provide an assessment of the costs and benefits of including or excluding chemicals in the range of available control tools.

Indirect Actions:

Information: ■ Public inform and involve program – prepare a brochure for distribution at offices and visitor centers, aimed at increasing public awareness of weed problems, recognition of weed species, understanding of forest weed control activities, and ways that forest users and volunteer groups can assist in prevention and control. Include information on noxious weed situations and control activities in published reports, mailings, and environmental education activities. ■ In-service training – circulate updates on research, control methods, preventive practices, and potential new invaders. Schedule training workshops for field going personnel.

Estimated information program cost for this alternative is $2,000 for brochure design and printing.

Biological Program: Provide about $25,000 a year to research and development of biological control techniques.

Prevention: Adhere to the standards, guidelines, and management requirements listed in Appendix D.

Inventory: Begin a systematic, sample-based program to inventory existing weeds, only on sites that are at (or adjacent to) high risk of resource impacts from weeds that would be suitable for non-chemical treatment. Spot check sites likely to be affected by new invaders, and track them as encountered by field going personnel performing other duties. For areas under cooperative agreements, thoroughly map the location, density, and trend of all noxious weed species included in the co-op agreements.

Estimated inventory program cost for this alternative is $7,500. This is less than Alternative C, because this inventory program would focus primarily on species and sites that could be effectively treated without chemicals.

Species Control Objectives:

Prevent or **eradicate** any new invaders.

Suppress *houndstongue* and ***dalmatian toadflax*** across the forest (limited acreage and non-chemical control effectiveness is moderate).

Suppress *spotted knapweed, diffuse knapweed, Canada thistle,* and ***goatweed*** in Co-op areas and the Special Management Areas listed in Table III-2 – **Tolerate** elsewhere (action is concentrated on high impact areas because infestation acreages are extensive and available control effectiveness is moderate).

Suppress *leafy spurge* and ***tansy*** in new infestations in Co-op areas and Special Management Areas (Table III-2), **Tolerate** elsewhere (established infestations are difficult to control).

Contain *Canada thistle* in Co-op areas and Special Management Areas (Table III-2) – **Tolerate** while seeking long-term biological control elsewhere (low impact species that tends not to persist in the absence of ground disturbing activity).

Direct Weed Control:

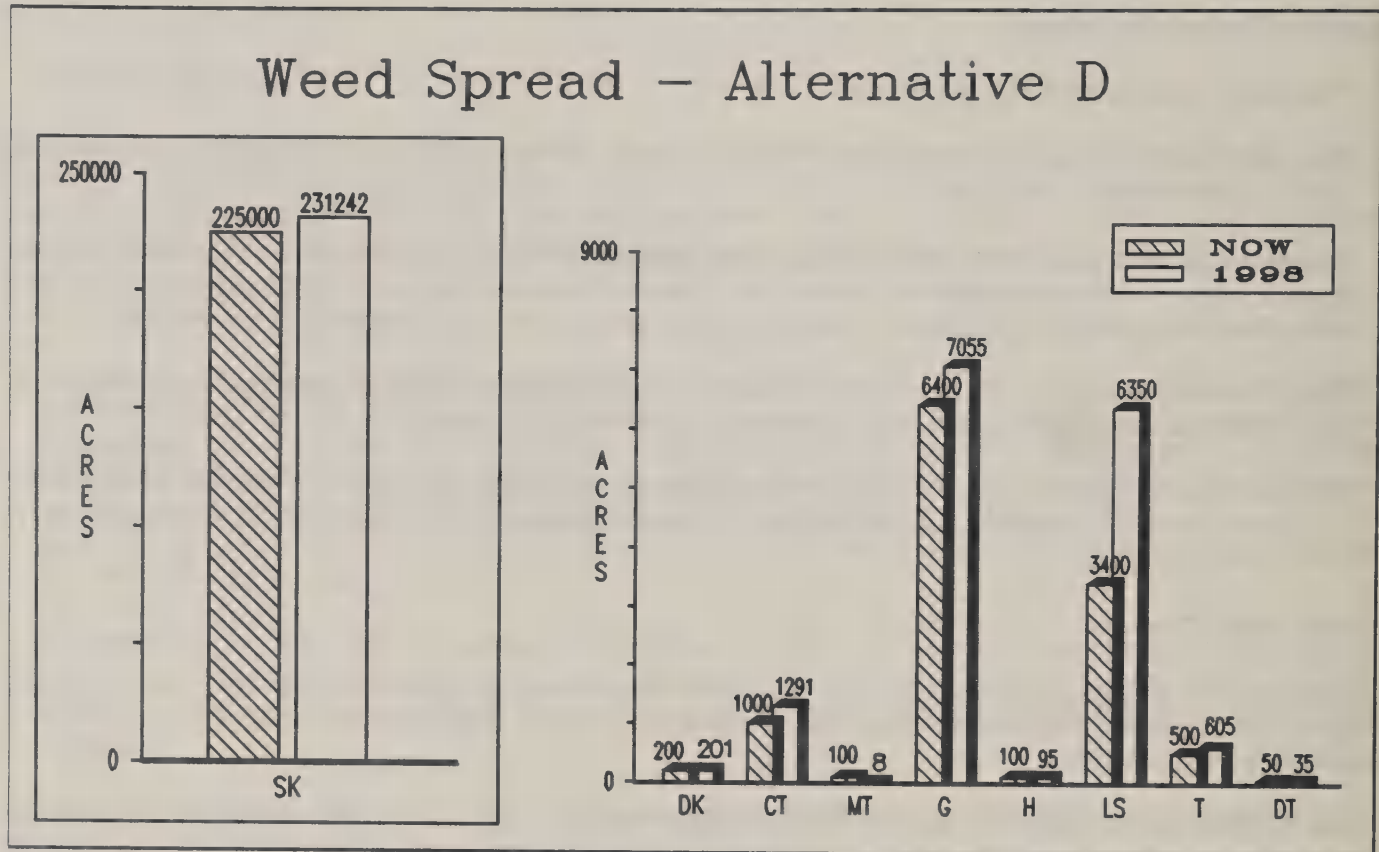
Expected weed acreages and treatment activities under Alternative D are shown in Figure II-1d, Table II-7d, and Figure II-2d. Since spotted knapweed already occurs at much higher levels than any other weed, it is graphed separately in Figure II-1d.

Table II-7d shows current and projected weed infestation acreages, based on the control activities projected under this alternative. The 1998 projections are based on the current acres and spread rate estimates displayed in the Affected Environment chapter.

TABLE II-7d. Control Acres (per decade) and 1998 Weed Projections – Alternative D

WEED SPECIES	PHYSICAL CONTROL	BIOLOGICAL CONTROL[1]	CHEMICAL CONTROL	TOTAL TREATED	1998 INFESTED	89-98 CHANGE	% CHANGE 89-98
Spotted knapweed	565	0	0	565	231,242	6,242	3%
Diffuse knapweed	55	0	0	55	201	1	0%
Canada thistle	10	0	0	10	1,291	291	29%
Musk thistle	5	100	0	105	8	-92	-92%
Goatweed	0	1,050	0	1,050	7,055	655	10%
Houndstongue	50	0	0	50	95	-5	-5%
Leafy spurge	0	500	0	500	6,350	2,950	87%
Tansy	50	0	0	50	605	105	21%
Dalmatian toadflax	100	0	0	100	35	-15	-30%
NEW INVADERS	5	0	0	5	0	0	0%
TOTAL ACRES	840	1,650	0	2,490	246,881	10,131	4%

[1]Does **not** include the indirect biological program which is measured in dollars rather than acres.



NOTE: the vertical axis is scaled at 0-250,000 acres for spotted knapweed, while the vertical axis for the other weeds is scaled at 0-9,000 acres. If both graphs were plotted at the same scale, the spotted knapweed graph would be 28 times higher than the other graph.

FIGURE II-1d. Current and Projected 1998 Infestation Estimates by Weed Species – Alternative D

Annual Control Treatment Acres:

Since most control methods would have to be re-applied to a treated site several times during a decade, average annual treated acres would be more than one tenth the acres listed above. The control acres shown above in Table II-7d indicate what would be treated during the decade, but not how often treatment would be repeated. In order to determine the average annual acres treated, those numbers must be adjusted by the repeat application frequencies discussed earlier in the "Control Methods" section (see Tables II-2, II-3, and II-6). Figure II-2d illustrates the estimated ***annual average*** level of control activities that would occur under this alternative. These are relative, upper-bound estimates for comparison purposes – they should not be interpreted as firm numbers.

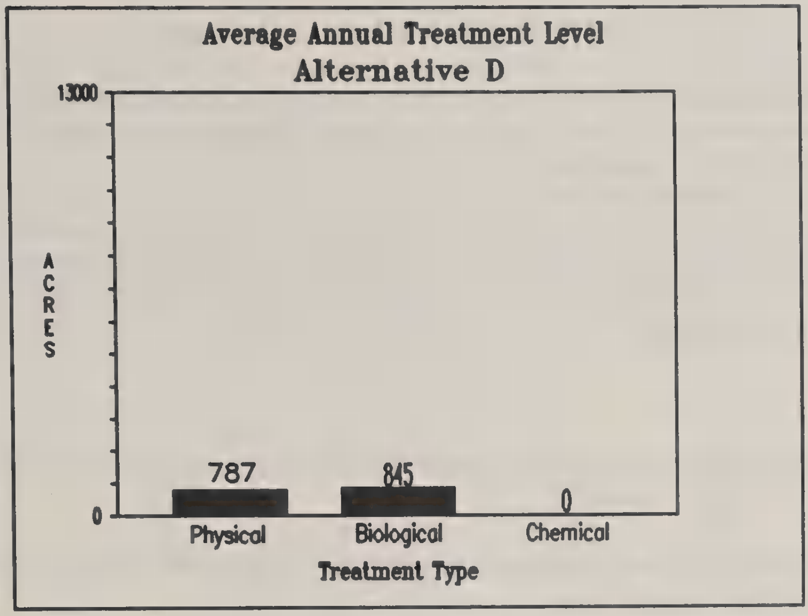


FIGURE II-2d. Average Annual Acres Treated with Physical, Biological, and Chemical Methods – Alternative D

ALTERNATIVE E

Objective: Attempt to eradicate or suppress noxious weeds from Lolo National Forest lands. Use physical, biological, or chemical methods to eradicate or suppress all existing noxious weeds, anywhere that they occur on the forest. Prevent or eradicate any new invader.

This alternative responds to the belief that the best way to prevent the spread of noxious weeds and their impacts on forest resources and adjacent landowners is to aggressively control all infestations. Even though it may not be realistic to expect that these weeds can be totally eliminated, tolerating them anywhere is seen as contributing to their potential spread.

Indirect Actions:

Information: In addition to the programs in Alternative C, develop an aggressive public advertising campaign similar to the fire prevention campaign.

Estimated information program cost for this alternative is $12,000 ($2,000 for a brochure, and $1,000 annually for an advertising campaign).

Biological Program: Provide about $25,000 a year to research and development of biological control techniques.

Prevention: Adhere to the standards, guidelines, and management requirements listed in Appendix D. Revise the forest Travel Plan to increase road and area closures for noxious weed control.

Inventory: On a sample basis, systematically inventory all noxious weed infestations across the entire forest.

Estimated inventory program cost for this alternative is $60,000.

Species Control Objectives:

Prevent or **eradicate** any new invaders.

Eradicate *diffuse knapweed, musk thistle,* and ***houndstongue*** across the forest (relatively limited acreage and effective control is available).

Eradicate *leafy spurge* and ***tansy*** in new infestations and roadsides (where treatment is relatively easy and effective) – **Suppress** established stands elsewhere.

Suppress *Canada thistle, goatweed,* and ***dalmatian toadflax*** across the forest (limited acreage and control effectiveness is moderate).

Suppress *spotted knapweed* where canopy (shrub and tree cover) is open (less than 55%) – **Contain** elsewhere (action is concentrated on high impact areas shading greater than 55% limits knapweed density and reproductive capacity).

Direct Weed Control:

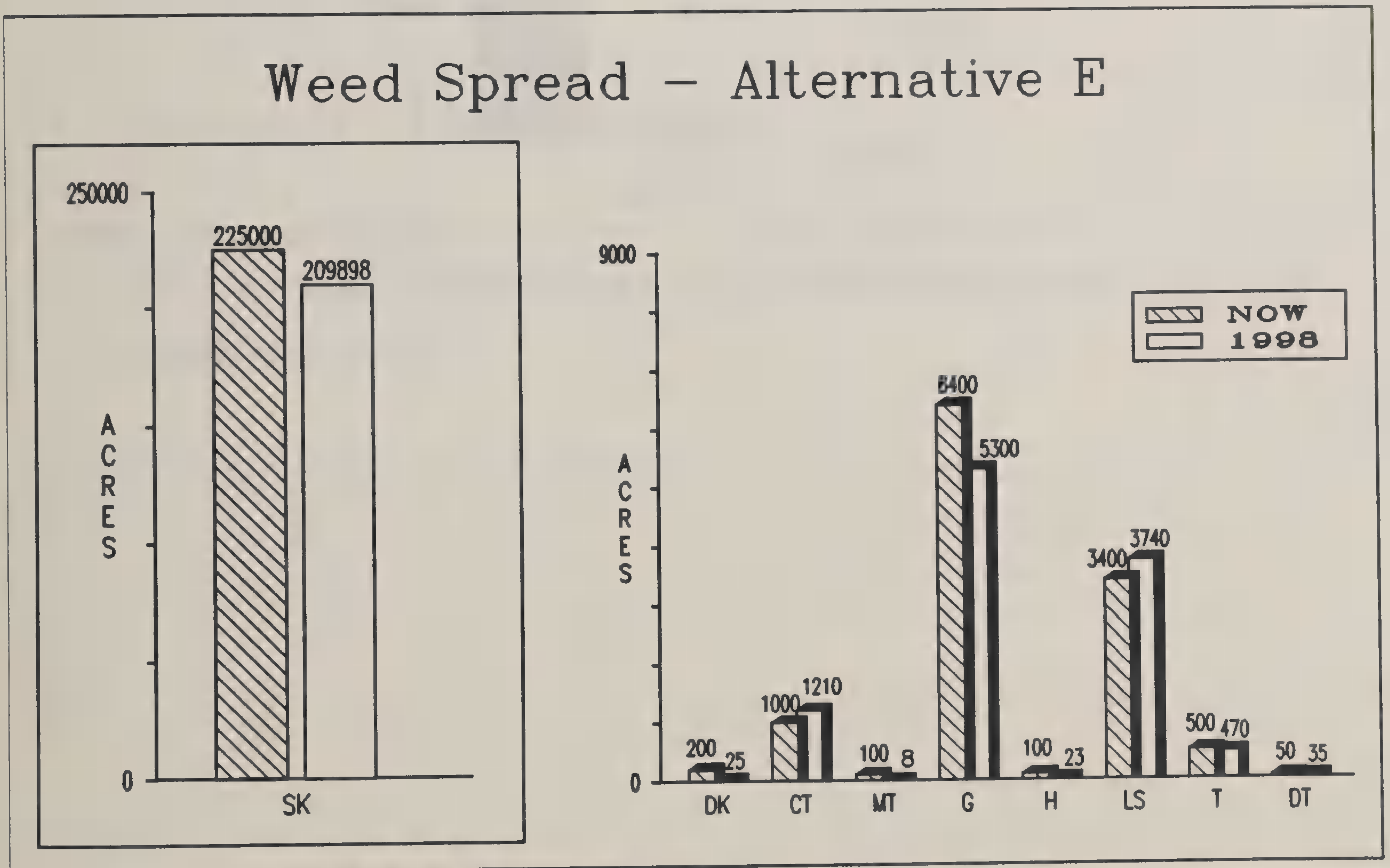
Expected weed acreages and treatment activities under Alternative E are shown in Figure II-1e, Table II-7e, and Figure II-2e. Since spotted knapweed already occurs at much higher levels than any other weed, it is graphed separately in Figure II-1e.

Table II-7e shows current and projected weed infestation acreages, based on the control activities projected under this alternative. The 1998 projections are based on the current acres and spread rate estimates displayed in the Affected Environment chapter.

TABLE II-7e. Control Acres (per decade) and 1998 Weed Projections – Alternative E

WEED SPECIES	PHYSICAL CONTROL	BIOLOGICAL CONTROL[1]	CHEMICAL CONTROL	TOTAL TREATED	1998 INFESTED	89-98 CHANGE	% CHANGE 89-98
Spotted knapweed	0	0	24,280	24,280	209,898	-15,102	-7%
Diffuse knapweed	0	0	250	250	25	-175	-88%
Canada thistle	0	0	100	100	1,210	210	21%
Musk thistle	5	100	0	105	8	-92	-92%
Goatweed	0	0	3,000	3,000	5,300	-1,100	-17%
Houndstongue	65	0	65	130	23	-77	-77%
Leafy spurge	0	500	2,900	3,400	3,740	340	10%
Tansy	50	0	150	200	470	-30	-6%
Dalmatian toadflax	50	0	50	100	35	-15	-30%
NEW INVADERS	0	0	5	5	0	0	0%
TOTAL ACRES	170	600	30,800	31,570	220,709	-15,941	-7%

[1]Does **not** include the indirect biological program which is measured in dollars rather than acres.



NOTE: the vertical axis is scaled at 0-250,000 acres for spotted knapweed, while the vertical axis for the other weeds is scaled at 0-9,000 acres. If both graphs were plotted at the same scale, the spotted knapweed graph would be 28 times higher than the other graph.

FIGURE II-1e. Current and Projected 1998 Infestation Estimates by Weed Species – Alternative E

Annual Control Treatment Acres:

Since most control methods would have to be re-applied to a treated site several times during a decade, average annual treated acres would be more than one tenth the acres listed above. The control acres shown above in Table II-7e indicate what would be treated during the decade, but not how often treatment would be repeated. In order to determine the average annual acres treated, those numbers must be adjusted by the repeat application frequencies discussed earlier in the "Control Methods" section (see Tables II-2, II-3, and II-6). Figure II-2e illustrates the estimated ***annual average*** level of control activities that would occur under this alternative. These are relative, upper-bound estimates for comparison purposes — they should not be interpreted as firm numbers.

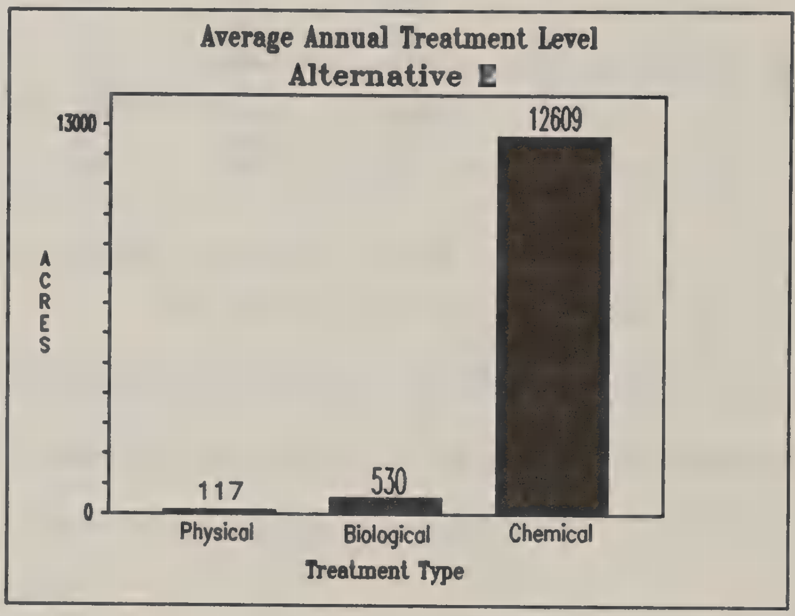


Figure II-2e. Average Annual Acres Treated with Physical, Biological, and Chemical Methods — Alternative E

COMPARISON OF ALTERNATIVES.

The comparisons in this section are based on the descriptions of the alternatives given earlier in this chapter, and on the environmental consequences analysis presented in Chapter IV. The estimated numbers that are displayed and compared below should be treated as relative rather than absolute numbers. The intent of these comparisons is to allow a reasoned choice among the alternatives. Actual implementation and the resulting numbers would depend on funding, cumulative site-specific factors, and unforeseeable details. The assumptions used to develop the numbers in Chapter IV tend to over-estimate both impacts and control effectiveness. For these reasons, the following numbers should be used for comparison between the alternatives only.

The alternatives are compared in six subsections:

- **Comparison of Objectives**
- **Comparison of Indirect Actions**
- **Comparison of Direct Control Treatments**
- **Comparison of Economics**
- **Comparison to Issues**
- **Comparison of Environmental Effects**

Comparison of Objectives.

The species specific control objectives are listed in each alternative description in the previous section, and below in Table II-8. These objectives were set by starting with the overall objective of the alternative, then adjusting for species-specific factors including degree of impact on resources, extent of current coverage, and effectiveness of control measure available under the alternative.

For instance, the overall objective for alternatives C and D is the same, but chemicals are prohibited in Alternative D. Some species can still be effectively treated without chemicals (perhaps with a shift to more intensive use of physical and biological methods) and their species-specific objectives are the same in alternatives C and D. Other species cannot be as effectively controlled on the same scale without chemicals, so their species specific objectives are adjusted downward in Alternative D.

TABLE II-8. Comparison of Control Objectives by Species

	A	B	C	D	E
SPOTTED KNAPWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS in Co-op areas & Special MAs; CONTAIN & seek biological control in other areas.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	SUPPRESS wherecanopy is open (<55%);CONTAIN wherecanopy is closed (>55%)
DIFFUSE KNAPWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	ERADICATE.
CANADA THISTLE	TOLERATE, seek biological control.	CONTAIN in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	CONTAIN in Co-op areas and Special MA's; TOLERATE, seek biological control in other areas.	CONTAIN in Co-op areas and Special MA's; TOLERATE, seek biological control in other areas.	SUPPRESS.
MUSK THISTLE	TOLERATE, seek biological control.	TOLERATE, seek biological contorl.	ERADICATE.	ERADICATE.	ERADICATE.
GOATWEED	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS in Special MAs & Co-op areas; CONTAIN elswhere.	SUPPRESS in Co-op areas & Special MAs; TOLERATE seek biological control in other areas.	SUPPRESS.
HOUNDSTONGUE	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS.	SUPPRESS.	ERADICATE.
LEAFY SPURGE	TOLERATE, seek biological control.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	SUPPRESS new infestations and in Co-op areas; CONTAIN elswhere.	SUPPRESS in Co-op areas; TOLERATE seek biological control in other areas.	ERADICATE new infestations; SUPPRESS established infestations.
TANSY	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE in other areas.	ERADICATE new infestations & roadsides; CONTAIN established infestations.	SUPPRESS in Co-op areas; TOLERATE in other areas.	ERADICATE new infestations; SUPPRESS established infestations.
DALMATIAN TOADFLAX	TOLERATE.	SUPPRESS in Co-op areas; TOLERATE in other areas.	SUPPRESS.	SUPPRESS.	SUPPRESS.
NEW INVADERS	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE.	PREVENT/ERADICATE

"Co-op Area" = areas where adjacent landowners have active weed control programs on their land.
"Special MA's" = those listed in the Affected Environment chapter, Table III-2.

Comparison of Indirect Actions.

Table II-9 displays the variation in indirect weed control programs among the alternatives. These programs are separate from and in addition to the direct control treatments that are discussed in the next section of this chapter.

Information Program: This program is at its lowest level in Alternatives A and B, where only informal, ad hoc training would be provided to field-going personnel. No additional funding would be provided for information in Alternatives A and B. Alternatives C and D include this same level of informal in-service training, plus about $2,000 for producing a brochure aimed at increasing public awareness of weeds. This brochure would probably would be a cost-share project with other agencies, so total production costs would be higher. Alternative E has the most aggressive information program, including everything discussed above plus $10,000 for formal in-service training and a cost-share public advertising campaign similar to the fire prevention campaign.

Prevention Program: This program is essentially the same under all alternatives. All would include the weed prevention mitigation measures listed in Appendix D. In addition, Alternative E would emphasize reduction of weed spread as a criterion for more road and area closures in the next revision of the forest's travel plan.

Inventory Program: The level of this program varies according to the overall objective of each alternative. Alternative A includes no additional funding for inventory work – weeds would only be tracked as encountered during other management activities. Inventory under Alternative B would be limited to comprehensive mapping of cooperative weed control areas involving adjacent landowners ($5,000). Alternatives C and D would include the mapping of cooperative areas plus a systematic, sample-based inventory of high risk sites across the forest – cost for Alternative C ($10,000) would be higher than Alternative D ($7,500) because the inventory in D would focus only on species and sites that could be effectively treated without chemicals. Alternative E would have the most intensive inventory program, systematic mapping of the entire forests ($60,000).

Biological Program: The indirect biological program is separate from and should not be confused with the direct biological treatments discussed in the next section. The indirect biological program involves funding projects (cost-shared with other agencies and groups) and providing sites for weed research focusing on the development of biological controls. Proposed funding increases with each alternative since the alternatives propose progressively more intense weed control efforts. Alternative D is higher than Alternative C because D has similar control objectives, but would not use chemicals, so reliance on biological controls would be higher.

TABLE II-9. Comparison of Indirect Actions

	A	B	C	D	E
INFORMATION PROGRAM (Decade)	LOW (in-service) **$0**	LOW (in-service) **$0**	MORE (in-service & brochure) **$2,000**	MORE (in-service & brochure) **$2,000**	MOST (in-service, brochure, & ad campaign) **$12,000**
PREVENTION PROGRAM	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D)	Management requirements (Appendix D) plus revised travel plan for more area & road closures
INVENTORY PROGRAM (Decade)	New invaders, only as encountered **$0**	New invaders, only as encountered; Comprehensive mapping of Co-op Areas **$5,000**	Systematic mapping of high-risk areas; Comprehensive mapping of Co-op Areas **$10,000**	Systematic mapping of high-risk areas treatable w/o chemicals; Comprehensive mapping of Co-op Areas **$7,500**	Systematic mapping of entire forest **$60,000**
BIOLOGICAL PROGRAM (Annual)	**$0**	**$7,000**	**$10,000**	**$25,000**	**$25,000**

Comparison of Direct Control Treatments.

Table II-10 displays the average annual direct control treatments for each alternative, ***assuming full funding and complete implementation***. Depending on budget constraints, full funding might not be available every year. Site-specific project planning will be done at the ranger district level, so these projections are just estimates. Actual treatment levels would probably be below these projected levels, and would not exceed them.

Since Alternative A is the No Action alternative, there would be virtually no treatments under it. Total weed acreage would increase by five percent over the decade. Alternative B includes virtually no physical or biological treatments because we assume that cooperative weed control projects with adjacent landowners would generally involve chemical herbicides when the full range of control tools is available. Total weed acreage at the end of the decade would increase by four percent under Alternative B, but would be held to a two percent increase under Alternative C. Alternative C includes moderate amounts of physical and biological treatments, and the second highest level of chemical treatments. At the end of the decade, total weed acreage would increase by two percent, which is lower than the increases projected for all other alternative except E.

Both biological and physical treatments would be highest under Alternative D, compensating for the unavailability of chemical herbicides in this alternative. Total weed acreage at the end of the decade would increase by four percent – similar to Alternative B, less than Alternative A, but more the Alternatives C and E.

Alternative E is the most aggressive control proposal and could actually ***decrease*** total weed acreage at the end of the decade by seven percent – compared to the two to five percent increases projected under the other alternatives. Alternative E includes physical and biological treatment levels similar to Alternative C, but includes nearly five times the acreage treated with chemicals.

TABLE II-10. Comparison of Direct Control Treatments (acres per year)

	A	B	C	D	E
PHYSICAL TREATMENTS	1	0	105	790	120
BIOLOGICAL TREATMENTS[1]	0	0	595	845	530
CHEMICAL TREATMENTS	0	810	2,740	0	12,620
CHANGE IN INFESTED ACRES (1989-1998)	+5%	+4%	+2%	+4%	−7%

[1]Does **not** include Indirect Biological Actions shown in Table II-9.

Tables II-11, II-12, and II-13 show the average annual acres treated with specific tools within the physical, biological, and chemical categories. Figures II-3, II-4, and II-5 graphically compare the treatment level for each of those categories. Figure II-6 compares the projected change in weed infested acres for the next decade under each alternative.

TABLE II-11. Comparison of Annual Physical Treatments (acres per year)

METHOD	A	B	C	D	E
Grub/Pull	1	0.2	57	139	57
Mow/Top	0	0	47	648	58

TABLE II-12. Comparison of Annual Biological Treatments (acres per year)

AGENT	A	B	C	D	E
Weevil (musk thistle)	0	0	30	30	30
Goats (leafy spurge)	0	0	315	315	0
Beetle (goatweed)	0	0	250	500	500

TABLE II-13. Comparison of Annual Chemical Treatments[1]

	A		B		C		D		E	
CHEMICAL	lbs	acres	lbs	acres	lbs	acres	lbs	acres	lbs	acres
Picloram	0	0	213	427	731	1,463	0	0	3,425	6,851
2,4-D	0	0	597	299	2,018	1,009	0	0	9,012	4,506
Glyphosate	0	0	352	87	1,125	278	0	0	5,155	1,273

[1]Pounds applied and acres treated have different relationships for each of these three chemicals. The numbers in this table are functions of the application rates and frequencies given earlier in this chapter (Tables II-5 and II-6).

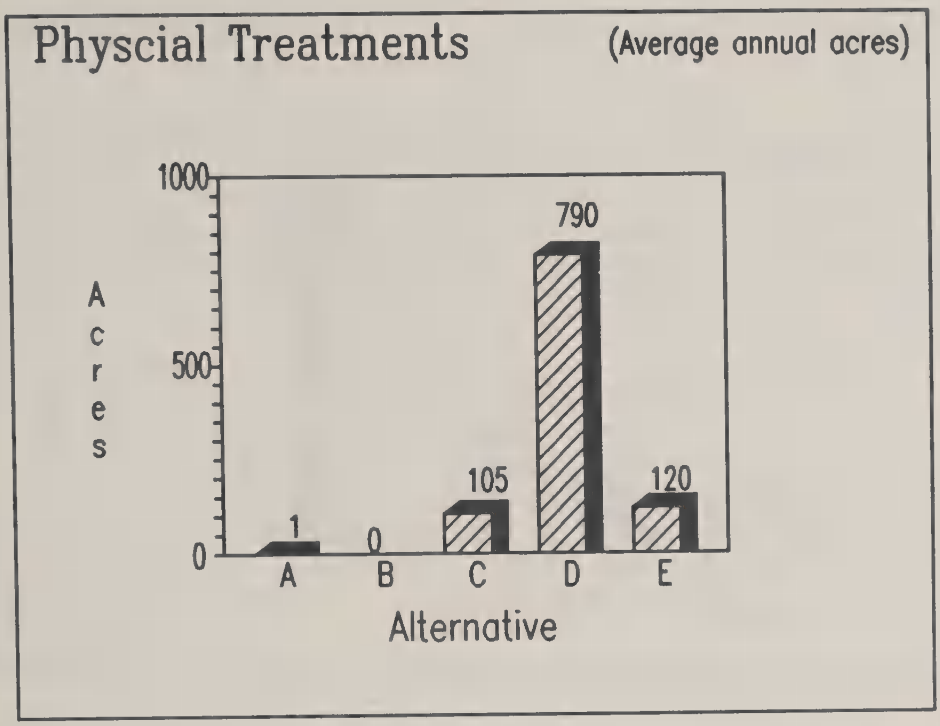


FIGURE II-3. Comparison of Physical Treatments, by Alternative

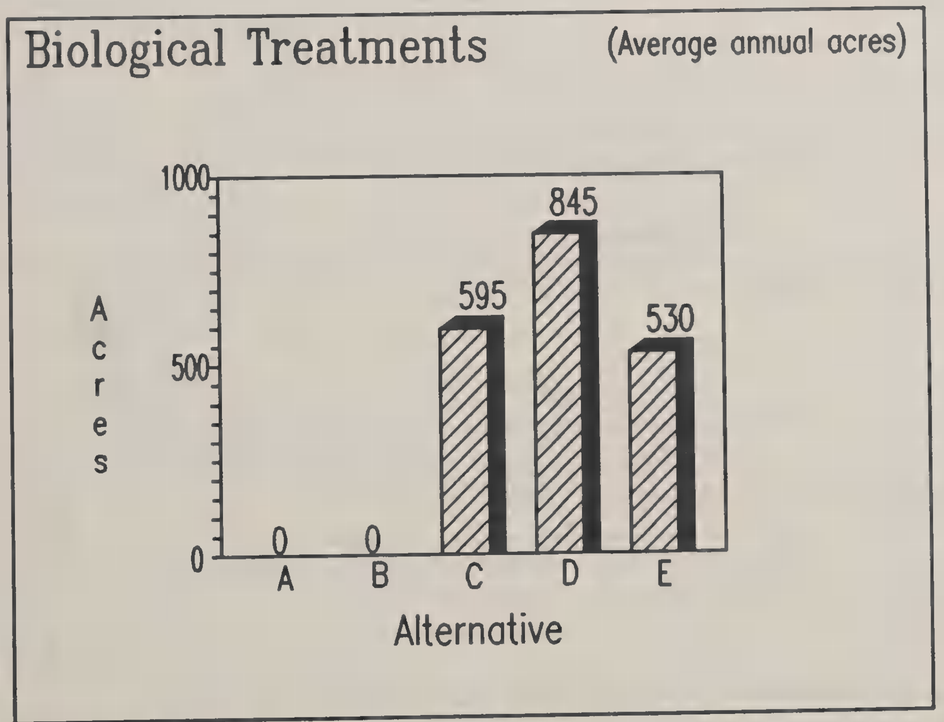


FIGURE II-4. Comparison of Biological Treatments, by Alternative

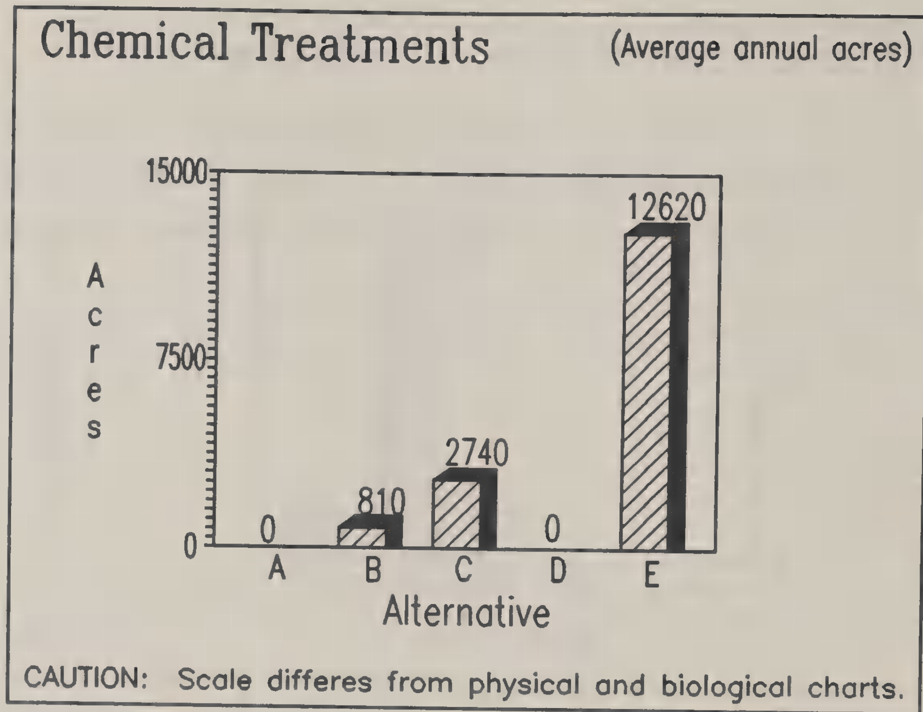


FIGURE II-5. Comparison of Chemical Treatments, by Alternative

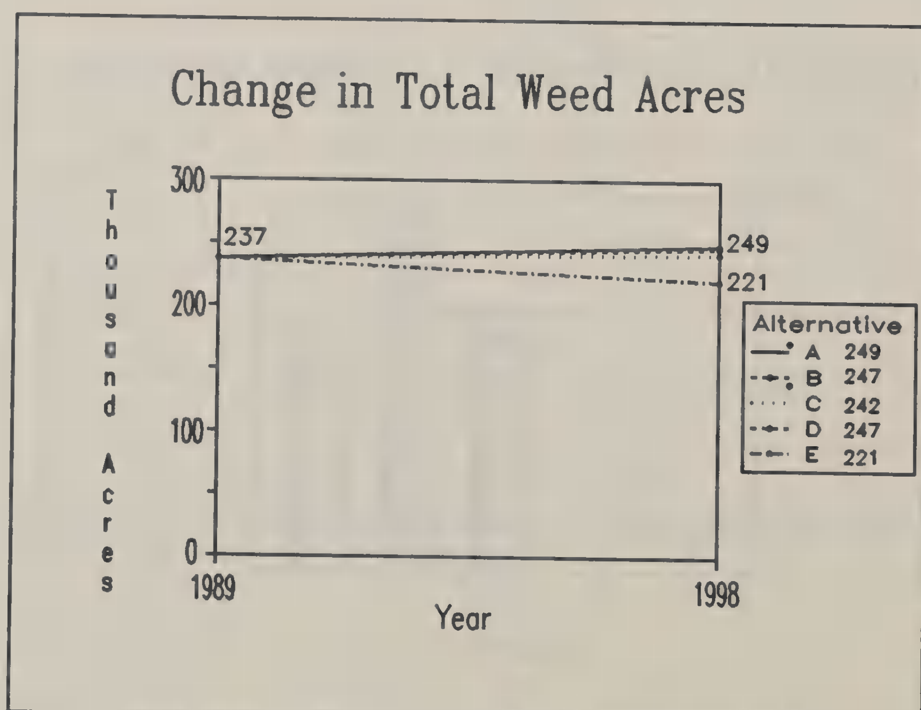


FIGURE II-6. Projected Change In Total Weed Acres, 1989-1998

Comparison of Economics.

Table II-14 compares total annual cost, cost per acre, and percent of current budget for each alternative. Alternative E has the highest cost, 19 times more than B, five times more than D, and four times more than C. Cost per acre is lowest for alternatives that rely most on picloram – Alternative B, followed by C and E. This is because picloram is persistent in the soil, and we've assumed that each acre treated with picloram would need only three applications per decade, while other treatments often would require annual application for effective control (see Table II-6). Per acre costs for each control tool are calculated in Appendix F, tables F-10, F-13, F-16.

TABLE II-14. Comparison of Economics

	A	B	C	D	E
TOTAL COST[1] (Annual)	$500	$73,600	$360,700	$278,800	$1,422,900
COST PER ACRE[2] (Annual)	$95	$32	$42	$98	$42
PERCENT OF CURRENT BUDGET[3]	0.00%	0.5%	2.4%	1.9%	9.5%

[1]Indirect Actions (Table II-9) ***plus*** Direct Control Treatments (Table II-10).
[2]Direct Control Treatments only – does ***not*** include the indirect program (Table II-9) costs.
[3]Current annual budget for the Lolo National Forest is approximately $15,000,000.

Over the next ten years, there will not be a significant impact on the Missoula area economy as a result of the presence and spread of noxious weeds. This is because the farm sector of the local economy generates less than one percent of the wage and salary employment. However, there are individual ranchers who rely on livestock forage from the Lolo National Forest to sustain their ranch operations.

It is possible that the spread of noxious weeds over several decades could have a significant long-term impact on non-market resources, especially on big-game wildlife populations, if the worst-case assumptions explained in Chapter IV hold. Some researchers are optimistic about the prospects for biological control of knapweeds and leafy spurge to reduce these weeds to tolerable levels in a decade or two.

The only resource impacts that are quantifiable in this analysis are range (livestock grazing) and big game (elk). Even so, the following numbers are very tentative, and should be considered only for relative comparison purposes, not as actual, absolute values.

Table II-15 shows that, under worst-case assumptions, all alternatives result in a loss of livestock range output values compared to the current situation. For big-game wildlife output values, only Alternative E shows an improvement over the current situation. For all action alternatives, these losses are less than what would be expected with Alternative A. The costs of all action alternatives are also greater than Alternative A.

The benefit-cost ratio of increased values and costs compared to Alternative A shows that none are particularly good investments when looking only at economically quantifiable costs and benefits. When compared to Alternative A, all other alternatives have a benefit-cost ratio less than one, which means that all alternatives result in a net loss over the ten year analysis period. Alternative B has the highest rank with an estimated return of eight cents per dollar spent. Alternative D has the lowest rank with less than one cent returned for each dollar spent. Alternative E has the largest absolute loss. Over ten years, Alternative E would show a discounted net loss of approximately $11 million.

TABLE II-15. Average Annual Change[1] in Value of Potential Range and Wildlife Outputs Compared to the Current Situation

	A	B	C	D	E
Range	−$10,000	−$9,800	−$8,500	−$8,700	−$1,200
Wildlife (Big Game)	−$36,700	−$31,600	−$21,000	−$36,700	+$10,600
TOTAL VALUE	−$46,700	−$41,400	−$29,500	−$45,400	+$9,400
Value Change Compared to No Action	0	+$5,300	+$17,200	+$1,300	+$56,100
Annual Weed Control Cost	$500	$73,600	$360,700	$278,800	$1,422,900
Cost Change Compared to No Action	0	+$73,100	+$340,200	+$278,300	+$1,422,400
Benefit-Cost Ratio of Change Compared to No Action	0	0.07	0.05	< 0.00	0.04
Annual Net Value Compared to No Action	0	−$67,800	−$343,000	−$277,000	−$1,366,300
Present Net Value[2] Over 10 Years Compared to No Action	0	−$549,900	−$2,782,000	−$2,246,700	−$11,081,900

[1]Using output level at midpoint of decade, worst-case scenario, and 1985 RPA unit values.
[2]Using 4% discount rate.

Table II-16 shows estimated changes in income and employeemnt for each alternative. These economic impacts include direct, indirect and induced effects on income and employment in the five counties of Flathead, Missoula, Mineral, Ravalli and Sanders. The majority of change in jobs and income is a result of changes in elk numbers and related hunting activity. The positive economic impacts estimated for Alternative E are a result of the expected one percent increase in elk numbers (125 animals) by the end of the first decade. For this EIS, economic impacts are not estimated beyond the first decade of implementation.

TABLE II-16. Total Economic Impacts from Changes in Grazing Outputs and Hunting RVDs Compared to the Current Situation (1st Decade)

	A	B	C	D	E
Total Income	−$389,000	−$389,000	−$233,000	−$384,000	+$97,000
Annual Average Employment (jobs)	−3.0	−2.7	−1.9	−2.9	+0.5

Comparison to Issues.

The last part of Chapter I lists thirteen issues that were developed during scoping for this EIS. The alternatives are compared below by each of those issues.

1. **How are noxious weeds defined on the Lolo National Forest?** All alternatives use the same definitions for noxious weeds (see Chapter I).

2. **What and how significant are the impacts of noxious weeds on forest resources – including native vegetation; threatened, endangered, or sensitive plants and animals; soils; water quality; aesthetics; wildlife and fish; and domestic livestock?** The effects of weeds under each alternative are compared in the next section of this chapter.

3. **Under what circumstances will the forest take weed control action to protect National Forest resources? How will sites be prioritized for treatment?** Control priorities are the same for all alternatives (see the Alternative Development section of this chapter), but the circumstances that would trigger control action vary. Virtually no control is proposed in Alternative A; Alternative B would control weeds only in cooperative areas where adjacent landowners are actively controlling weeds; Alternatives C and D would control weeds in those cooperative areas, and throughout the forest where weeds threaten National Forest resources. Alternative E would be most aggressive, followed by Alternative C. Alternative D would rely solely on biological and physical control methods, and would not be quite as aggressive as Alternative C.

4. **What management objectives can be identified for each noxious weed species that affects or may affect the forest?** Management objectives fore each weed species vary among the alternatives. See Table II-8 for a comparison.

5. **How can the forest work with other interested or affected parties – such as adjacent landowners, weed boards, government agencies, contractors, allotment permittees, or volunteer groups – to deal with shared aspects of the noxious weed situation?** Under all alternatives except A, the forest would cooperate with adjacent landowners and with county weed control districts on direct weed control projects. Alternatives C, D, and E include additional amounts of funding for public awareness campaigns that could be conducted in cooperation with other agencies and groups (see Table II-9, Information Program). All alternatives have the same weed prevention mitigation requirements (see Appendix D). Many of those requirements would apply to contractors, permittees, and other forest users. Some requirements would be mandatory clauses in contracts, others would be voluntary.

6. **How can road construction, travel management, recreation management, range management, and other forest activities be adjusted to control the spread of noxious weeds?** All alternatives have the same mitigation requirements aimed at reducing weed spread. See Appendix D and the last section of this chapter.

7. **How would the weed management methods proposed in each alternative – including preventive, mechanical, biological, manual, and chemical methods – affect human health and the natural environment?** Environmental effects of control methods are compared in the next section of this chapter.

8. **How can the forest cost-effectively manage noxious weeds under various budget constraints?** The economics of the alternatives are compared in the previous section in this chapter.

9. **How will the forest collect data on the extent and spread of noxious weeds; how will it monitor the effects of weed management activities?** All alternatives have the same general monitoring plan (Appendix C), but the intensity of monitoring is directly proportional to the intensity of control efforts, which does vary. Also, some monitoring is specific to control methods (e.g., chemical herbicide use) and would not be carried out in alternatives that don't employ that type of control.

10. **When chemical herbicides are considered viable control tools, which chemicals will be used?** No chemicals would be used under Alternatives A or B. For the other alternatives, chemical herbicides are restricted to the three listed earlier in this chapter (picloram, 2,4-D, and glyphosate), in the Alternative Development section.

11. **How would chemical use be restricted; how would chemical accidents be handled?** Alternatives B, C, and E have the same mitigation measures for preventing adverse effects from chemicals. See Appendix D and the last section in this chapter.

12. **How would sites be revegetated after noxious weed control actions?** Revegetation requirements are the same for all alternatives. See the mitigation measures in Appendix D, and the monitoring plan in Appendix C for details.

13. **How can the forest support research into biological and other alternative weed control methods; how will noxious weed training and new information be disseminated to Forest Service employees, permittees, and contractors?** Funding support for research increases progressively with each alternative, going from A to D. Alternative E is the same as D. See the Biological Program comparison in Table II-9.

Comparison of Environmental Effects.

The following comparisons are based on the analysis presented in Chapter IV, and the Summary of Impacts by Alternative near the end of that chapter.

Human Health and Safety.

Physical and biological weed control methods pose no significant risks to human health and safety, but chemical use can pose very slight risks. Those risks are summarized below and are based on conservative, worst-case assumptions, including comparing short-term exposure to long-term safety levels. These risks are non-existant in Alternatives A and D (no chemical use), and very slight in the other alternatives. Since chemical use increases from Alternative B to C to E, these very slight risks would increase in the same progression. Please read pages IV-2 through IV-5 and Appendix G for discussion of these risks.

Toxicology. A very small but unknown portion of the population may be hyper-sensitive to herbicides. This is a very rare condition, but symptoms can be severe and long-lasting. The general population (non-workers) would never receive doses above published NOELs (no observed effect level). Under two improbable scenarios for non-workers (a person consumes large quantities of unwashed, recently sprayed vegetation; or an adolescent spends an entire day within a right-of-way spray project), the ADI (acceptable daily intake over a lifetime) might be exceeded for a single day. Workers using picloram or glyphosate would never receive doses above NOELs, and their doses would exceed ADIs only if they failed to use protective clothing. All workers using 2,4-D could possibly exceed the ADI, and those failing to use protective clothing could receive doses approaching the NOEL.

Cancer and Mutation. Human cancer risks from exposure to picloram, 2,4-D, and glyphosate seem to be very low – perhaps on the same order as saccharin. However, scientific uncertainty over cancer risks still exists. Known risks to the general (non-worker) population are thought to be too low to detect in epidemiology studies. The lifetime risk to workers (assuming application for 30 days each year for 30 years) is thought to range from 0.5 in one million to 50 in one million. See Table IV-1 for a comparison of one-in-a-million cancer risks.

Major Accidents. The worst-case accident – a herbicide spill into a small drinking water reservoir – would cause the drinking water to exceed ADIs for less than one day. The probability of such an accident is far less than one in 34,000 years.

Vegetation.

Projected infestation acres at the end of the decade are shown for each weed species in Figure II-7. Alternative E is the most aggressive weed control alternative, and projects significant reductions in all weeds except Canada thistle (was not targeted for aggressive control because it's not considered a significant problem), and leafy spurge which is very difficult to control.

Alternative C is the second most aggressive, and projects significant reductions in diffuse knapweed, musk thistle, and dalmatian toadflax. Spotted knapweed, goatweed, and houndstongue would be held near current levels. Leafy spurge and tansy would spread beyond current levels, but at significantly slower rates than under alternatives A, B, or D. Compared to Alternative A, Alternatives B and D offer some reduction in most weed spread rates, with Alternative D offering more control of musk thistle, goatweed, houndstongue, tansy, and dalmatian toadflax.

Ecological integrity, diversity, and sensitive plants can be negatively affected by both weeds and chemical herbicides. These effects from weeds increase with projected weed spread (A > B > D > C > E). However, the potential effects from chemical use are ranked in nearly the opposite order (E > C > B > A or D).

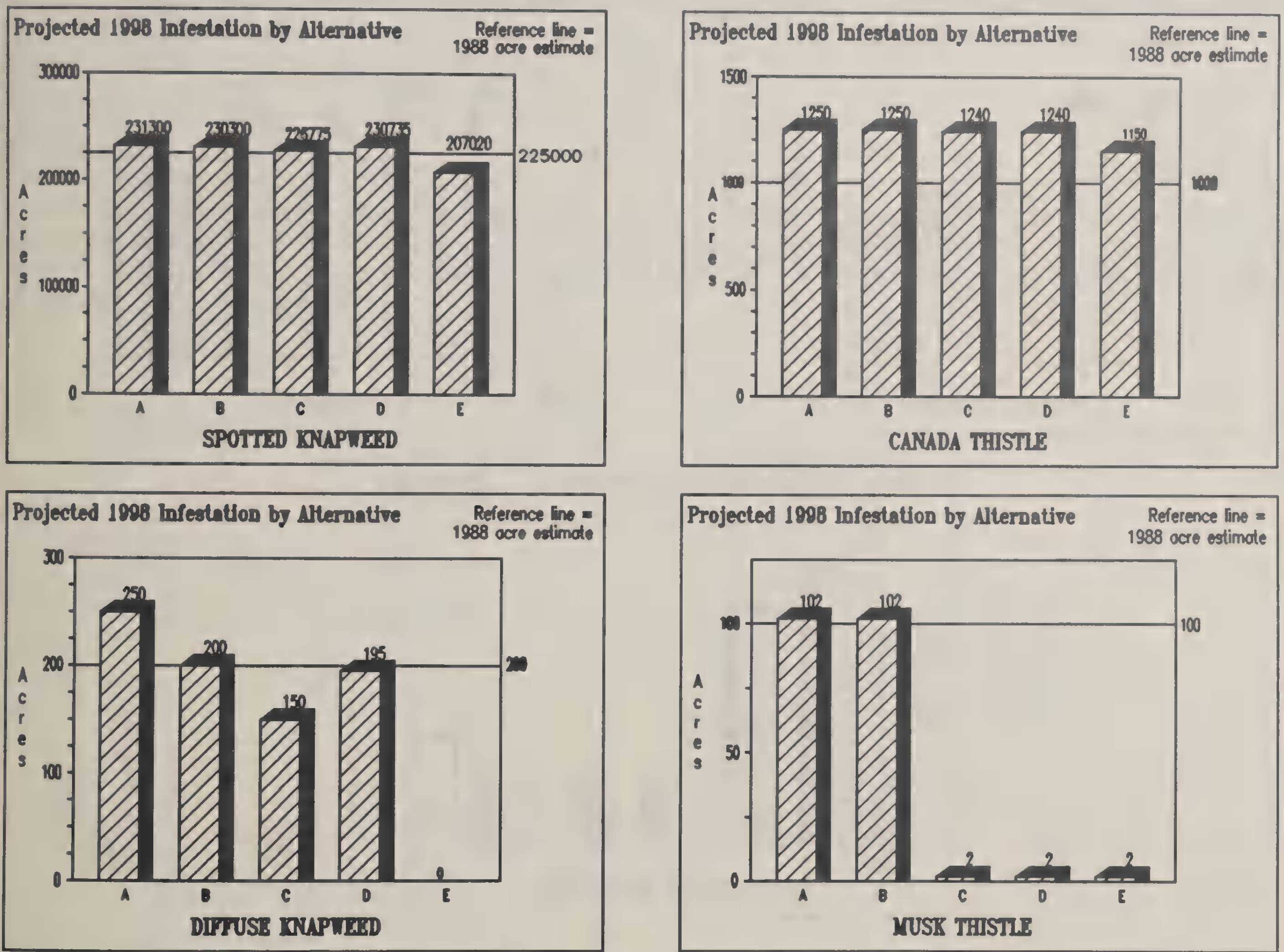


FIGURE II-7. Projected 1998 Infestation Acres, by Alternative and Species
(Please notice that the acre scale is different for each weed. The horizontal line in each graph shows the current (1989) acre estimate.)

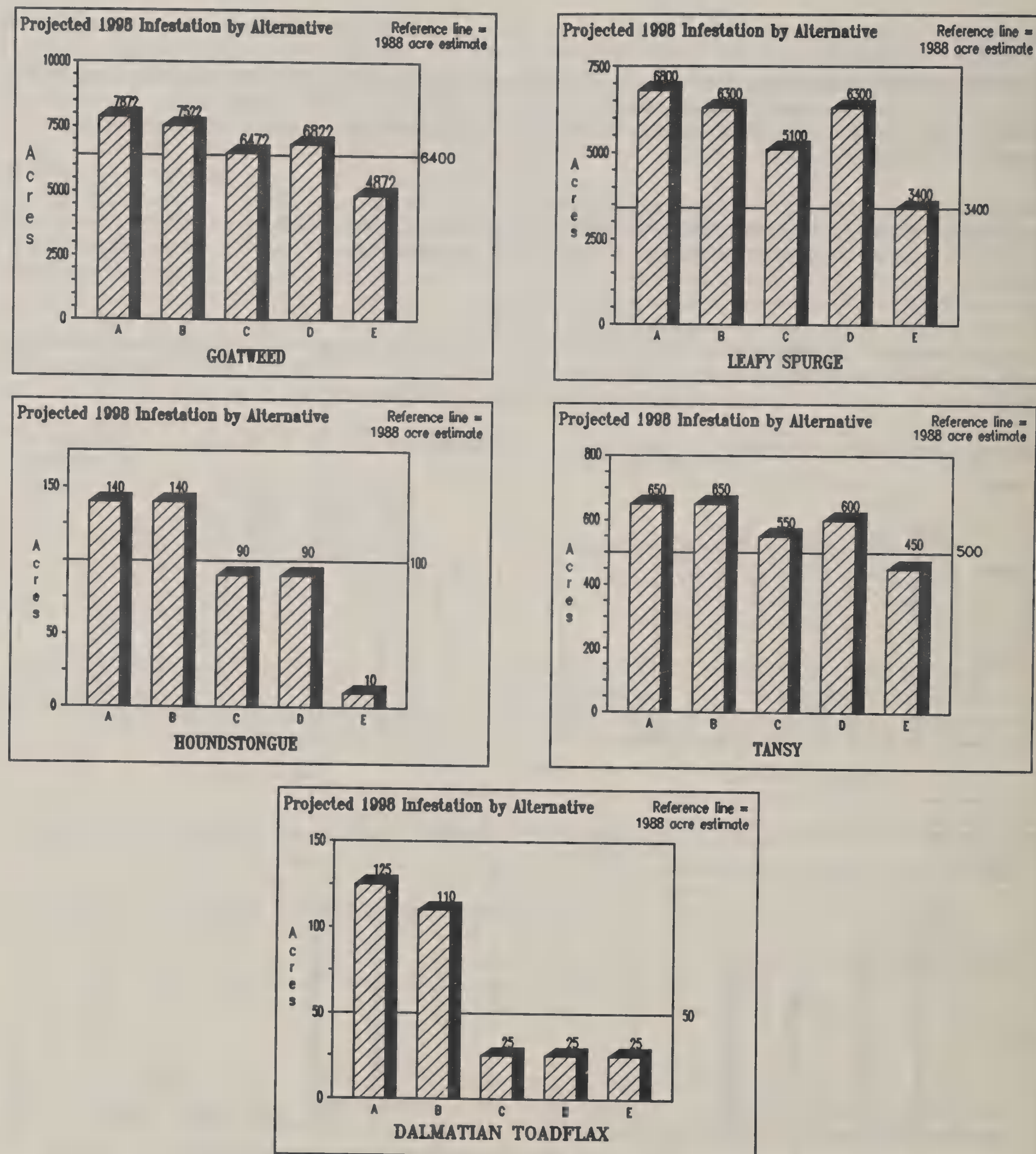


FIGURE II-7. Projected 1998 Infestation Acres, by Alternative and Species (Continued)
(Please notice that the acre scale is different for each weed. The horizontal line in each graph shows the current (1989) acre estimate.)

Recreation and Visual Quality.

Weed effects on recreation and visual quality depend largely on individual perceptions and values. Some people are philosophically or aesthetically offended by weeds, some are physically irritated, many don't notice them, and some find flowering weeds attractive. Likewise, weed control impacts depend on individual perceptions and values. Many would not even notice weed control actions, some would be pleased, and others may be annoyed by or might want to avoid areas grazed with goats or treated with herbicides.

Alternatives A and B would not treat recreation areas, so weed effects would be highest in those alternatives. Weed control is highest in Alternative E, followed by C, then D. Alternatives E and C also include chemical control, which may affect some people's use of recreation sites.

Cultural Resources.

Alternatives E, C, and D would allow removal of weeds and restoration of the visual aspect of historic sites. Since chemicals would not be used in Alternative D, Alternatives E and C would probably be more effective. The use of herbicides in Alternatives E, C, and B would require consultation with Native American Cultural committees to prevent impacts on religious and cultural sites or activities.

Wildlife.

Potentially significant wildlife effects are limited to big game winter range. Worst-case projections indicate a potential loss of 18 percent of the forest-wide winter range forage productivity if weeds continue to spread at current rates for 50 years. Actual effects are expected to be less than this. Current potential forage productivity loss due to weeds is about three percent.

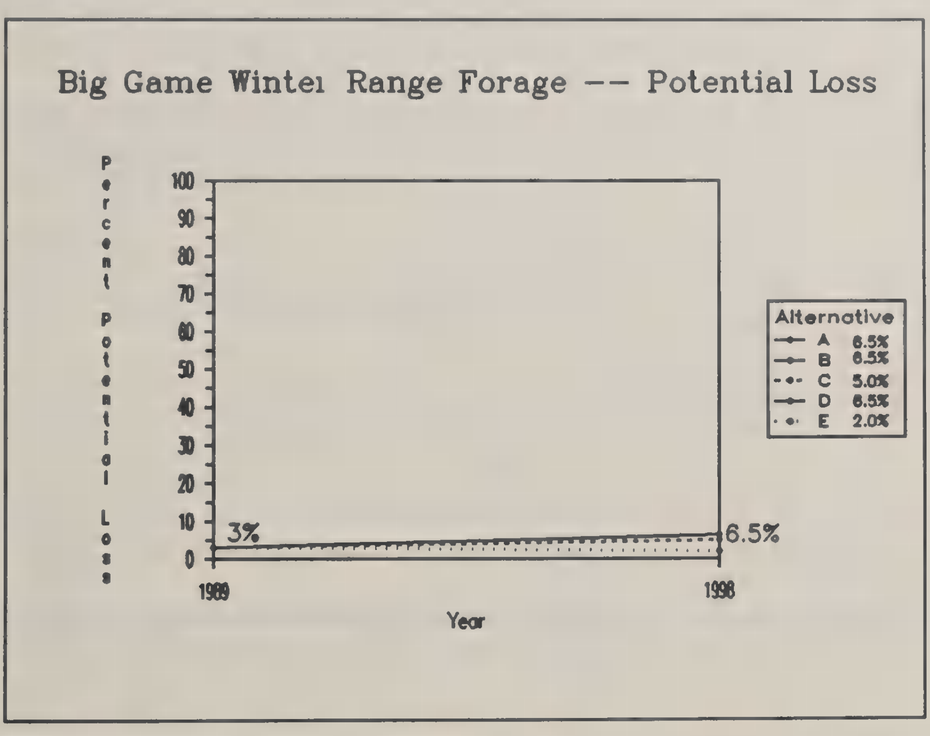


FIGURE II-8. Worst-Case Loss in 1998 Potential Big Game Winter Range Forage, by Alternative

Over the next decade, under worst-case assumptions, weeds could reduce potential big game winter range forage productivity by 6.5 percent in Alternatives A, B, and D; by five percent in Alternative C; and by two percent in Alternative E. Since current loss is three percent, Alternative E would show an improvement over the current situation in ten years. These trends are shown in Figure II-8.

Aquatic Habitat and Fisheries.

Weeds themselves have no significant effects on this forest's fisheries, but some weed control methods pose small risks of negative impacts if proper safeguards and mitigation measures are not followed. Improper grazing of riparian areas by goats used for biological weed control could reduce stream shade and increase sedimentation. Spills of 2,4-D or picloram into streams could cause fish kills, but the likelihood of such an accident is small. These risks increase with increases in herbicide use and amount of grazing for weed control. Although the risks are small for all alternatives, they are ranked as follows: E > C > B > D > A.

Range.

Using worst-case assumptions, current loss in potential livestock range productivity due to weeds is about 12 percent forest-wide. Over the next decade, this loss could climb to 25 percent in Alternatives A and B; to 23 percent in Alternatives C and D; and to 13 percent in Alternative E. These trends are shown in Figure II-9.

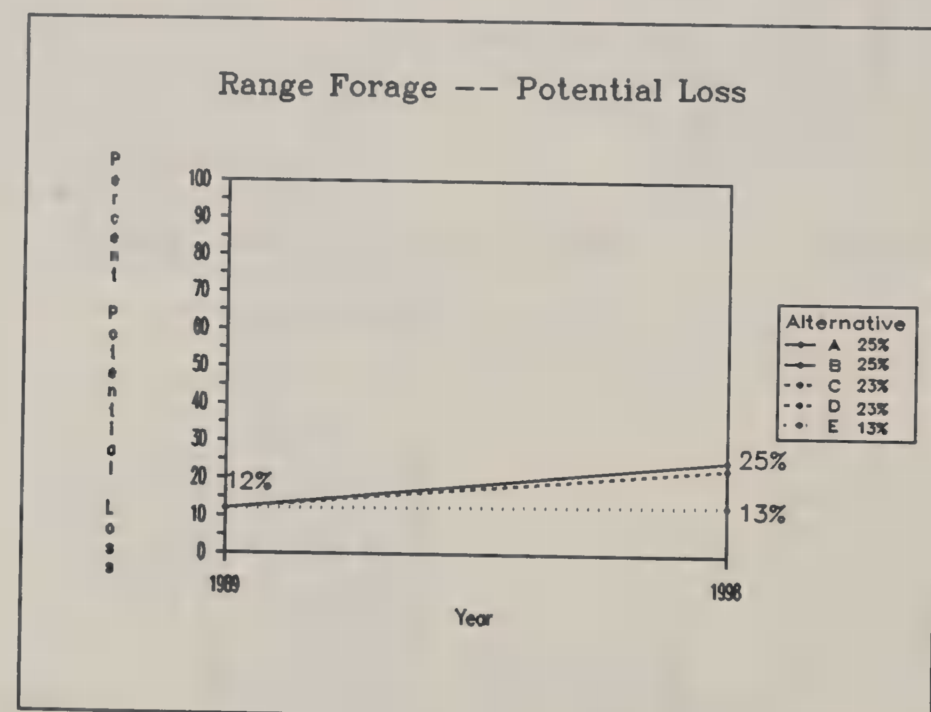


FIGURE II-9. Worst-Case Loss In 1998 Potential Range (Livestock Grazing) Forage, by Alternative

Timber.

Alternative E could impact non-target conifers if herbicide projects were not carefully designed for timing, buffer zones, etc. Other alternatives that include herbicides (B and C) might also have these impacts, but the locations

and total area proposed for spraying under those alternatives would result in insignificant impacts on a forest-wide basis. Mitigation measures in Appendix D should prevent these impacts, even in Alternative E.

Water and Soils.

In alternatives B, C, and D, short-term effects on water quality are possible from accidental spills of herbicides, but the risks are small and the effects would be minor. Weed control and revegetation could have minor beneficial impacts of reduced sedimentation. This effect would be highest in Alternative E.

Minerals.

Forest-wide, none of the alternatives would have significant effects on minerals activities.

Roads.

The only significant effect on roads would be in Alternative E, where additional roads might be closed to public motorized use for weed control purposes.

MITIGATION.

Appendix D lists management requirements designed to mitigate environmental effects of noxious weeds, and of weed control projects. Those requirements must be followed unless site-specific environmental analysis determines that the intent of a requirement could be met through other means.

There are two categories of management requirement in Appendix D. The first category covers weed prevention measures, organized by program, and would be required in all alternatives. The second category includes requirements for all weed control projects, organized by control method (physical, biological, or chemical).

Appendix I shows how the management requirements from Appendix D would be amended to the Forest Plan under Preferred Alternative C. The forest plan amendment also includes objectives and standards designed to mitigate weed effects and possible impacts of weed control projects.

Weed Prevention. Measures in this category minimize the spread of weeds and their effects on the environment. These measures can partially interfere with ways that weed seeds spread, and can reduce the creation of new sites where weeds could become established. Requirements include quick re-vegetation of soil disturbed during any forest management activity; fertilization to maintain desired vegetation cover; cleaning of equipment and removal of weed seedheads along access roads before equipment moves into weed-free areas; retaining shade; and including weed risk factors in the environmental analysis and evaluation of all forest management projects.

Weed Control Project Mitigation. These measures require project-specific environmental analyses, biological assessments for Threatened, Endangered, and Sensitive species, and job hazard analyses to protect worker health and safety. These requirements ensure that site-specific mitigations are developed.

Physical Control Methods. Requirements in this sub-category avoid potential heavy equipment effects on soil and streamside shade.

Biological Control Methods. These requirements ensure that grazing effects on soil, riparian vegetation, and recreation sites are minimized.

Chemical Control Methods. This sub-category includes a large number of measures designed to minimize the risks and impacts of accidental spills, drift onto non-target resources, to ensure re-establishment of desired vegetation, protect worker and public health and safety, and to notify and involve Native Americans and other interested parties.

CHAPTER III – AFFECTED ENVIRONMENT

Chapter III.

AFFECTED ENVIRONMENT

This chapter describes where weeds or control measures may occur on the Lolo, and identifies the environmental or resource elements that may affect or be affected by weeds or weed control. Weeds are defined and listed in Chapter I, while control methods are described in Chapter II. Elements of the affected environment are only introduced here. Analysis of ***how*** these environmental elements are or could be affected by weeds or control actions is presented in Chapter IV.

The Lolo Forest Plan FEIS (USDA 1986) has a Chapter III that describes the affected environment for the Lolo. That chapter is incorporated by reference into this EIS. Here we'll follow the same outline to make referencing easier. Each section or subsection will be *briefly* summarized, adding new information only when required for this EIS. There are five sections in this chapter:

- **General Setting** – describes land ownerships, county boundaries, and special Forest Plan Management Areas (MA's).

- **Physical Setting** – describes topographic, climatic, and visual factors.

- **Biological Setting** – describes vegetation, habitat groups, sensitive plants, areas at risk to weed infestation, and current weed infestation and spread rate estimates.

- **Social and Economic Setting** – describes population, economic, lifestyle, receipts, and budget factors.

- **Affected Resources** – describes aspects of the following areas that may affect or be affected by weeds or control measures:

    - Recreation
    - Cultural Resources
    - Wilderness, Roadless, and Special Areas
    - Visual Quality
    - Wildlife
    - Aquatic Habitat and Fisheries
    - Range
    - Timber
    - Water and Soils
    - Minerals
    - Lands
    - Roads
    - Protection (including fire)
    - Air Quality

GENERAL SETTING.

The Lolo National Forest stretches for 120 miles in west-central Montana, from the Continental Divide to the Idaho border. Width varies from 40 to 80 miles. The Clark Fork of the Columbia River is the major drainage. Interstate 90 bisects the forest.

Land Ownership and County Boundaries.

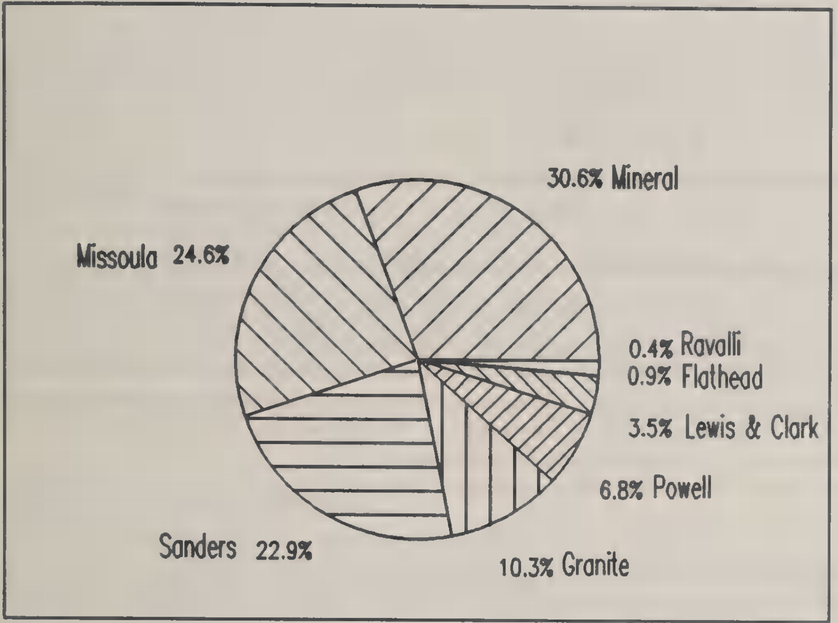
Individual landowners have different management objectives for their land. The Lolo Forest Plan sets out objectives for National Forest System lands by Management Area. Adjacent private landowners may have agricultural or other land management objectives that are more sensitive to weed effects than are forest management objectives.

As discussed in the Direction section of the Chapter I, county weed boards are responsible for coordinating weed control actions under state laws. The exterior boundary of the Lolo lies in nine different Montana counties (Flathead, Granite, Lake, Lewis and Clark, Mineral, Missoula, Powell, Ravalli, and Sanders). The Lolo also shares a common boundary with a Montana county (Lincoln), and with three Idaho counties (Clearwater, Idaho, and Shoshone).

Figure III-1 shows the Lolo National Forest in white. Actual land ownership in the white region is checkerboard and intermingled with many other landowners. For instance, even though a small portion of Lake County is shown within the Lolo boundary, there is now no Federal land in that portion of Lake County.

FIGURE III-1. Area Map, Lolo National Forest and Local Counties

Figure III-2 shows acres and percentage of the land administered by the Lolo National Forest within each county. Total acreage administered by the Lolo is 2,083,192 (this does not included 29,045 acres administered by the Deerlodge National Forest).



County	Acres
Mineral	646,857
Missoula	519,620
Sanders	484,469
Granite	218,081
Powell	144,788
Lewis & Clark	74,332
Flathead	18,907
Ravalli	8,131
Lake	0

FIGURE III-2. Lolo National Forest Land by County

Special Management Areas.

Due to special circumstances, several of the Lolo Forest Plan Management Areas (MA's) may require different intensities of weed control actions or mitigation measures. The impacts of weeds or sensitivity to certain types of control methods may be higher in these MA's in comparison to the rest of the forest. Therefore, the general objectives of an alternative may be modified somewhat in some of these MA's.

For example, the hay and winter range pastures at the Ninemile administrative site have management objectives unique to the forest; noxious weeds in this case must be approached from an agricultural, rather than a forest management perspective. Another example is wilderness. Since noxious weeds are non-native plants and may disrupt native ecosystems, these weeds can be detrimental to the wilderness management objective of preventing evidence of human intrusion on the landscape. This particular effect might not be such a concern in many of the other MA's.

Some alternatives may refer to these management areas and will list special control objectives, methods, or management requirements. These special management areas are listed in Table III-1. For further description of these MA's, see the Lolo Forest Plan (USDA 1986)

TABLE III-1. Special Management Areas

MA	DESCRIPTION
2	ADMINISTRATIVE SITES (grounds around ranger stations, work centers, etc., and the pastures at Ninemile)
3	HISTORIC SITES (historical, archeological, or paleontological sites; examples include Fort Fizzle, Halfway House, and Mountain House)
5	UTILITY CORRIDORS (existing or potential rights-of-way for transmission lines, pipelines, etc.)
6	RESEARCH NATURAL AREAS (relatively undisturbed areas which are representative of various natural ecosystems)
7	DEVELOPED RECREATION SITES (campgrounds or picnic areas with convenience facilities)
8	SKI AREAS
9	AREAS OF CONCENTRATED PUBLIC USE (special recreation areas and National Trails System Act trails)
12	WILDERNESS (proposed or Congressionally designated wilderness areas)
13	RIPARIAN WITH GRAZING PERMITS
14	RIPARIAN WITHOUT GRAZING PERMITS
15	NONRIPARIAN AREAS WITH GRAZING PERMITS
18	BIG GAME WINTER RANGE WITH TIMBER PRODUCTION
19	BIG GAME WINTER RANGE WITHOUT TIMBER PRODUCTION
22	BIG GAME WINTER RANGE WITH TIMBER PRODUCTION AND HIGH VISUAL SENSITIVITY
23	BIG GAME WINTER RANGE WITH TIMBER PRODUCTION AND MEDIUM VISUAL SENSITIVITY
28	RATTLESNAKE NATIONAL RECREATION AREA
–	ROADSIDES (this is not an MA in the Forest Plan, but roadsides are often sites of concentrated weed infestations, as well as ideal sites for the establishment and spread of weeds. Roadsides also happen to be rather easy to treat with high intensity. Therefore, roadsides present both special weed problems and treatment opportunities.)
–	MUNICIPAL WATERSHEDS (the Forest Plan prohibits the use of chemical pesticides in the Ashley Creek Municipal Watershed (Thompson Falls).)

PHYSICAL SETTING.

The Lolo lies in the Northern Rocky Mountains, which are characterized by north-to-south oriented ranges separated by flat valley bottoms and foothill benches and terraces. Principal rocks in the general area are metamorphosed sediments of the Precambrian Belt Supergroup. Agrillaceous, silty, and sandy rocks make up the predominant lithology of the Belt, with some impure carbonate rocks as well. Quaternary-age unconsolidated alluvium is found in most valley bottoms. Pleistocene glaciation is evident throughout the area, and glacial drift deposits and lakebed sediments from Glacial Lake Missoula are common in valley bottoms and terraces.

Topography.

Terrain is highly dissected, steep, and rugged. Most of the land is heavily timbered with conifers, but many south-facing slopes are grassy, open, and park-like. Mountains are often higher than 7,000 feet and show the effects of alpine glaciation: bowl-like cirque basins, U-shaped valleys, and narrow, serrated ridgelines or aretes. While midslopes are generally steep (slope greater than 50 percent), gentle slopes are often found near larger streams and some ridgetops.

Precipitation and Climate.

Atmospheric conditions are modified by aspect and slope, and become progressively cooler and more moist as elevation increases. Climatic zones range from the semiarid and relatively warm valley bottoms through a broad range of cool, moist coniferous forests to the cold, moist subalpine and alpine mountain tops. The average annual precipitation for the forest is 42 inches, two thirds of which falls as snow. In valley bottoms along the Clark Fork, average annual precipitation is closer to 14 inches. The area is affected by both Pacific Maritime and Continental weather systems.

Visual.

The landscapes of the Lolo are largely within the Columbia Rockies Character Type described in *Visual Character Types* of the Northern Region (USDA 1980). Roughly 30 percent of these lands outside of wilderness have distinctive scenic quality. Approximately 80 percent of the Lolo has a relatively natural appearance.

BIOLOGICAL SETTING.

The noxious weeds listed in the Purpose and Need chapter (Table I-1) have not been inventoried or mapped on the Lolo. The intensity of inventory and mapping differs among the alternative programs, depending the need for such information. For instance, if No Action is selected, there would be no need to comprehensively map weed occurrence for the entire forest.

Since we don't know specifically where the weeds occur, we have to estimate the level and location of weed infestations. The questions that we need to answer to make this estimate are:

- What types of environments or management areas are potentially affected by these weeds? (See the "area at risk to weeds" section).

- How many acres do these weeds currently occupy, and how fast are they spreading? (See the "current infestation and spread rates" section).

Those questions are addressed in the next two sections of this chapter.

Area at Risk to Weeds.

Weeds can have effects in two different situations. The first situation involves plant ecology. The second situation includes non-ecological issues.

Ecological Risk: A plant species generally has a range of environmental conditions under which it may out-compete other species (crowd out other plants). Outside this range, it may survive at low density levels that have little to no effect on other plants. In this ecology-based situation, only habitat types where weeds significantly crowd-out other desirable plants would be considered at risk for weed effects.

Non-Ecological Risk: In the second situation, the mere presence of a weed plant could have an effect independent of the weed's ecological impact on other nearby vegetation. An example would be individual, scattered plants along a roadside, in a habitat where the weed can survive but not dominate other plants. If this road leads to other habitat types that could be ecologically impacted by the weed, then these scattered plants could serve as a source for weed spread into those areas. Another example would be scattered plants in a research natural area or wilderness, where the presence of non-native vegetation could be seen by some as a negative effect, even if other plants are not crowded out.

Long-Distance Transport: It is possible that weeds on Lolo National Forest roads and trails could be picked up by people, vehicles, or animals and carried for very long distances to infest new areas far removed from the Lolo. There are many other weed-infested ownerships in western Montana that could also contribute to such long-distance transport. Such effects are beyond the scope of this EIS.

Table III-2 lists the acres at ecological risk for each weed. The habitat type/phase system is explained in Pfister and others (1977). Habitat types differentiate sites based on their expected climax plant communities (the trees and shrubs that dominate a site at the end of plant succession, thought to be a steady-state in the absence of major disturbance). Habitat types can be used to represent a complex of site factors including aspect, climate, soil, elevation, etc. For instance, dry, low-elevation, south-facing sites on well-drained soils might be in the ponderosa pine/wheatgrass habitat type, while a typical low-elevation, moist creek bottom would be grand fir/beadlily.

Table III-2 is adapted from Losensky (1987, Appendix A), with these modifications:

- ☐ Only the habitat types or phases that Losensky rated as moderate or high risk for any of the nine weed (species are listed. Many of the habitat types on the Lolo were rated as low to no risk, and are omitted from this table. Here are the definitions risk level definitions:

  High – noxious weeds may frequently dominate native vegetation following disturbance or through invasion into an undisturbed community;

  Moderate – noxious weeds may dominate interspaces of native vegetation but sites generally have a limiting factor which prevents full development of the weed;

  Low – noxious weeds occur as single plants or small groups and will not dominate native vegetation;

  No – environmental conditions are unsuitable for the survival of the weed.

- ☐ Only habitat types or phases that are inventoried on the Lolo National Forest are listed.

- ☐ The acres values come from a query of the forest plan data base. The data base was last updated on (June 30, 1987, and this query was executed on June 8, 1988.

Losensky's Appendix A lists 46 habitat types or phases that are at moderate or high risk for the nine noxious weed species of interest here. The query of the forest plan data base indicates that 14 of those types or phases have 0 acres on the Lolo National Forest. That leaves the 32 habitat types or phases listed below. The table gives an indication of which weeds might overlap and where that overlap might occur.

Although low risk areas are not included in Table III-2, some low risk habitat types may be affected by weeds in the special management areas discussed in the General Setting section. This table also does not account for areas at risk on adjacent ownerships.

The habitat types in Table III-2 are arranged in an order that goes roughly from low, warm, dry habitats to high, cool, moist. Tansy stands out as the only weed that has significant risk in the moister habitat types, and it does not overlap with the other weeds. On the other hand, all the other weeds seem to be limited to the drier, open canopy habitats, with a good deal of overlap. One implication is that the highest weed risk is largely in the valley bottoms and areas of less dense tree canopy coverage. This means weed risk is concentrated largely near forest boundaries where weeds from national forest land could spread to affect neighboring land.

TABLE III-2. Habitat Types at Ecological Risk to Each Weed Species

HABITAT TYPE/PHASE	ACRES	SK	DK	CT	MT	G	H	LS	T	DT
G12 – Mountain meadow	4,547			CT	MT			LS		
G13 – Mountain grassland	10,902	SK	DK	CT		G	H	LS		DT
130 – PP/Wheatgrass	811	SK	DK	CT		G	H	LS		DT
170 – PP/Snowberry	815	SK	DK	CT		G	H	LS		DT
210 – DF/Wheatgrass	74	SK	DK	CT		G	H	LS		DT
220 – DF/Idaho fescue	73	SK	DK	CT		G	H	LS		DT
230 – DF/Rough fescue	45,111	SK	DK	CT		G	H	LS		DT
G23 – Scree (010)	160,594	SK	DK			G	H	LS		DT
262 – DF/Ninebark-Pinegrass	75,136	SK				G	H	LS		
310 – DF/Snowberry	14,018	SK	DK					LS		
311 – DF/Snowberry-Wheatgrass	1,636	SK	DK			G	H	LS		
312 – DF/Snowberry-Pinegrass	11,190	SK	DK					LS		
313 – DF/Snowberry-Snowberry	2,044	SK	DK					LS		
320 – DF/Pinegrass	76,885	SK				G		LS		
321 – DF/Pinegrass-Wheatgrass	12,523	SK	DK			G	H	LS		DT
322 – DF/Pinegrass-Kinnikinnick	9,367	SK				G		LS		
324 – DF/Pinegrass-PP	7,732	SK	DK			G		LS		
330 – DF/Elk sedge	2,579	SK						LS		
340 – DF/Spirea	17	SK	DK			G	H	LS		DT
350 – DF/Kinnikinnick	8	SK	DK			G	H	LS		DT
360 – DF/Juniper	20	SK	DK					LS		
G16 – Alder glade	4,946								T	
440 – S/Goldthread	232								T	
520 – GF/Beadlily	66,056								T	
530 – WRC/Beadlily	81,878								T	
532 – WRC/Beadlily-sarsparilla	76								T	
550 – WRC/Devil's club	1,028								T	
570 – MH/Beadlily	248								T	
610 – AF/Devil's club	241								T	
620 – AF/Beadlily	100,875								T	
621 – AF/Beadlily-Beadlily	174								T	
630 – AF/Goldthread	4,954								T	
Lolo NF TOTAL (risk to all weeds)	**696,790**									

TOTAL ACRES AT RISK BY WEED SPECIES

SK	DK	CT	MT	G	H	LS	T	DT
431,535	267,568	62,333	4,547	401,684	315,432	436,082	260,708	238,630

LEGEND: SK = spotted knapweed; **DK** = diffuse knapweed; **CT** = Canada thistle; **MT** = musk thistle; **G** = goatweed; **H** = houndstongue; **LS** = leafy spurge; **T** = Tansy; **DT** = dalmatian toadflax.

Current Infestation and Spread Rate Estimates.

The preceding section indicates where weeds are a potential ecological problem. The best available estimate of current infestation levels is presented below. The estimates shown in Table III-3 are based on data from Losensky (1987) and more recent information developed by the interdisciplinary team. The term "*infested*" includes Losensky's ***moderate*** and ***high*** dominance risk, as explained above in the "area at risk to weeds" section. Assumptions and calculations are documented in the analysis file.

TABLE III-3. Current Infestation and Spread Rate Estimates by Weed Species

WEED SPECIES	1988 INFESTED ACRES[1]	10-YEAR SPREAD RATE
Spotted knapweed	225,000	3%
Diffuse knapweed	200	25%
Canada thistle	1,000	30%
Musk thistle	100	2%
Goatweed	6,400	25%
Houndstongue	100	40%
Leafy spurge	3,400	100%
Tansy	500	30%
Dalmatian toadflax	50	150%
TOTAL INFESTED	236,750	

[1]"Infested Acres" are those where the weed dominates or threatens to dominate native vegetation. See the discussion in the previous section ("Area at Risk to Weeds").

The data in Table III-3 are the basis for the quantification of the alternatives presented in the Alternative chapter. For example, the projected 1998 weed infestation levels for Alternative A are determined by multiplying the current infestation estimate by the spread rate for each weed. For the other alternatives, the level of weed control action is determined by estimating the number of acres that must be controlled over the planning decade to meet the species-specific objective for each alternative, given the current acreage and spread rate.

The three percent spread rate for spotted knapweed may seem low to some people. This spread rate deals only with movement into new, weed-free areas. It does not account for "fill-in" or increases in weed density on sites that are already infested. This analysis assumes that spotted knapweed has already occupied, at least at low levels, most of the moderate and high risk habitat on the Lolo. Further "spread" of spotted knapweed will be filling in sites already infested.

One way to picture the data given in these tables is to compare the current infestation estimates in Table III-3 to the acres at risk shown in Table III-1. Figure III-3 on the next page graphs that information for each weed.

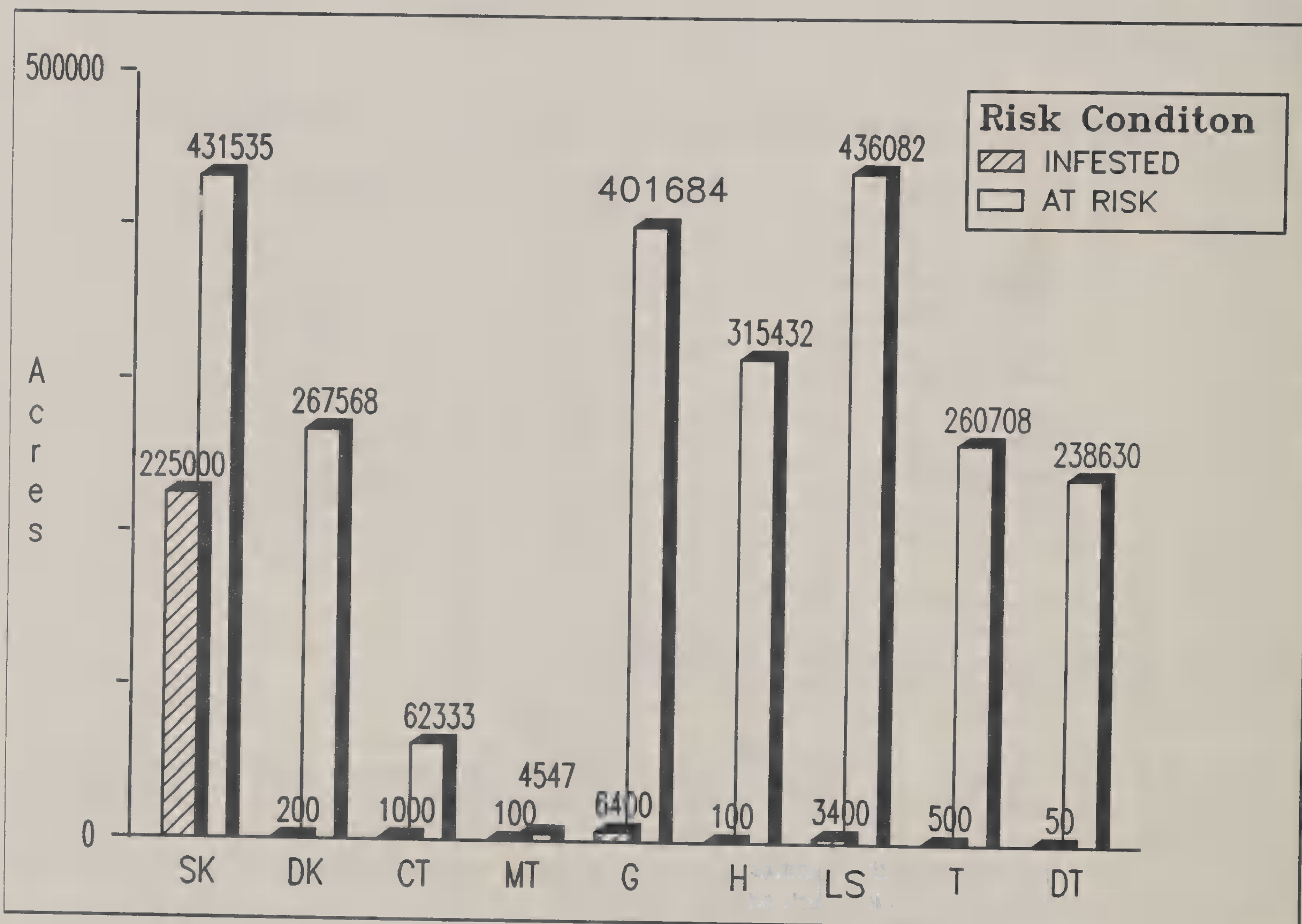


FIGURE III-3. Current Infestation and Area at Risk for Each Weed

Notice t[illegible]ted knapweed is the only species that is approaching its potential risk coverage. At about 225,000 acres, it is in a separate class from the other weeds which range from 50 to 6,400 acres.

If the assumption that spotted knapweed has already occupied most of the moderate and high risk habitat on the Lolo is correct, then this graph overestimates the acreage at risk and/or underestimates current infestation levels. None the less, this chart gives our best estimate for both current infestations and area at risk for each weed.

Another perspective on the same data is provided in Figure III-4. This time, current infestation and area at risk are shown in proportion to the entire area of the Lolo National Forest.

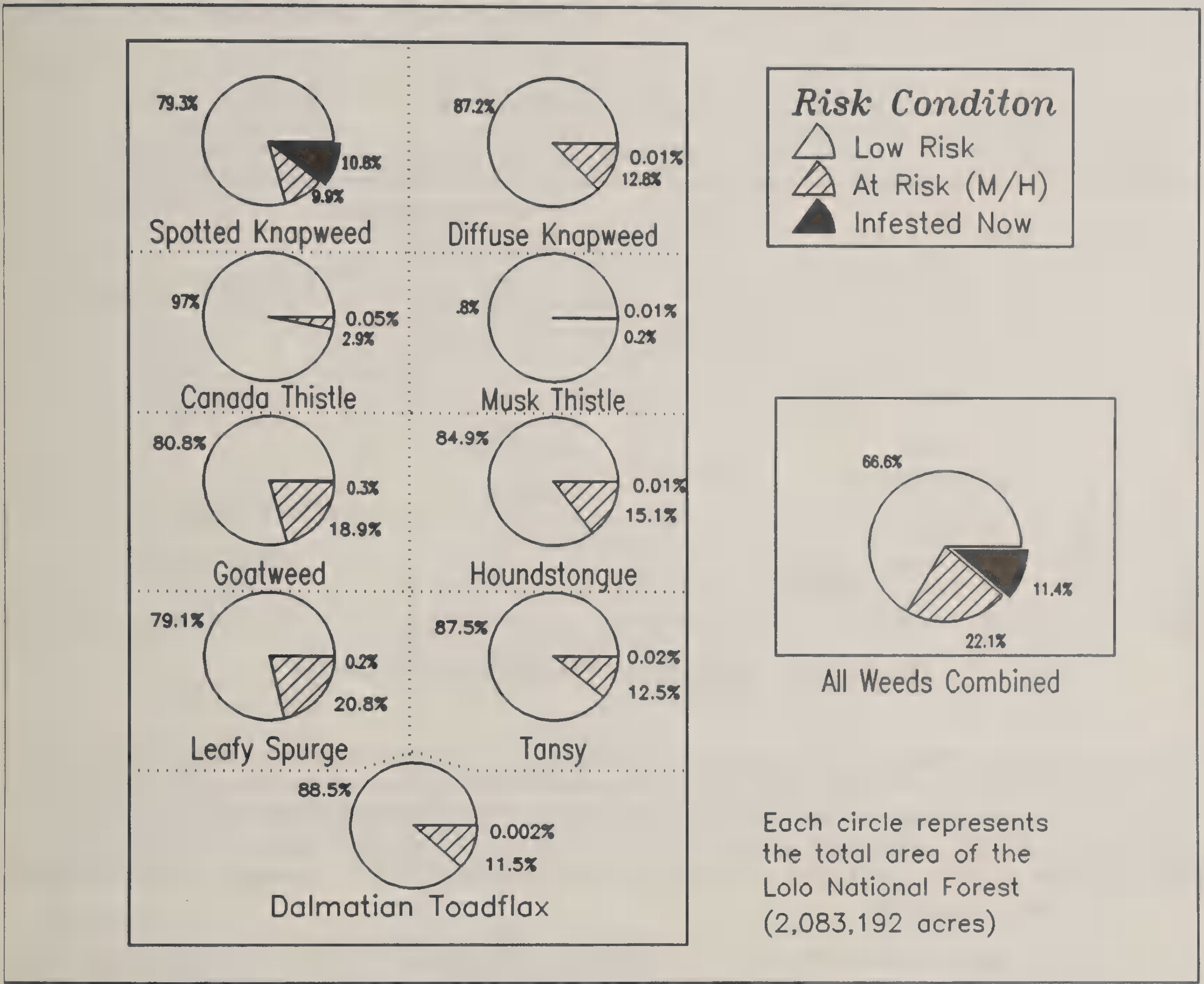


FIGURE III-4. Current Infestation and Area at Risk, Proportional to Entire Forest Area

Once again, spotted knapweed dominates the picture. While two thirds of the Lolo National Forest is not at risk to moderate or high weed infestation, eleven percent of the forest is occupied by spotted knapweed. Spotted knapweed already occupies over half of the area at risk. None of the other weed current coverages show on pie charts at the scale of the entire forest. This is not to say that the other weeds may not be a threat, just that all weeds except spotted knapweed appear to be at relatively early stages in their invasion of the forest. This situation can be illustrated by hypothetical population growth curves, as shown in Figure III-5.

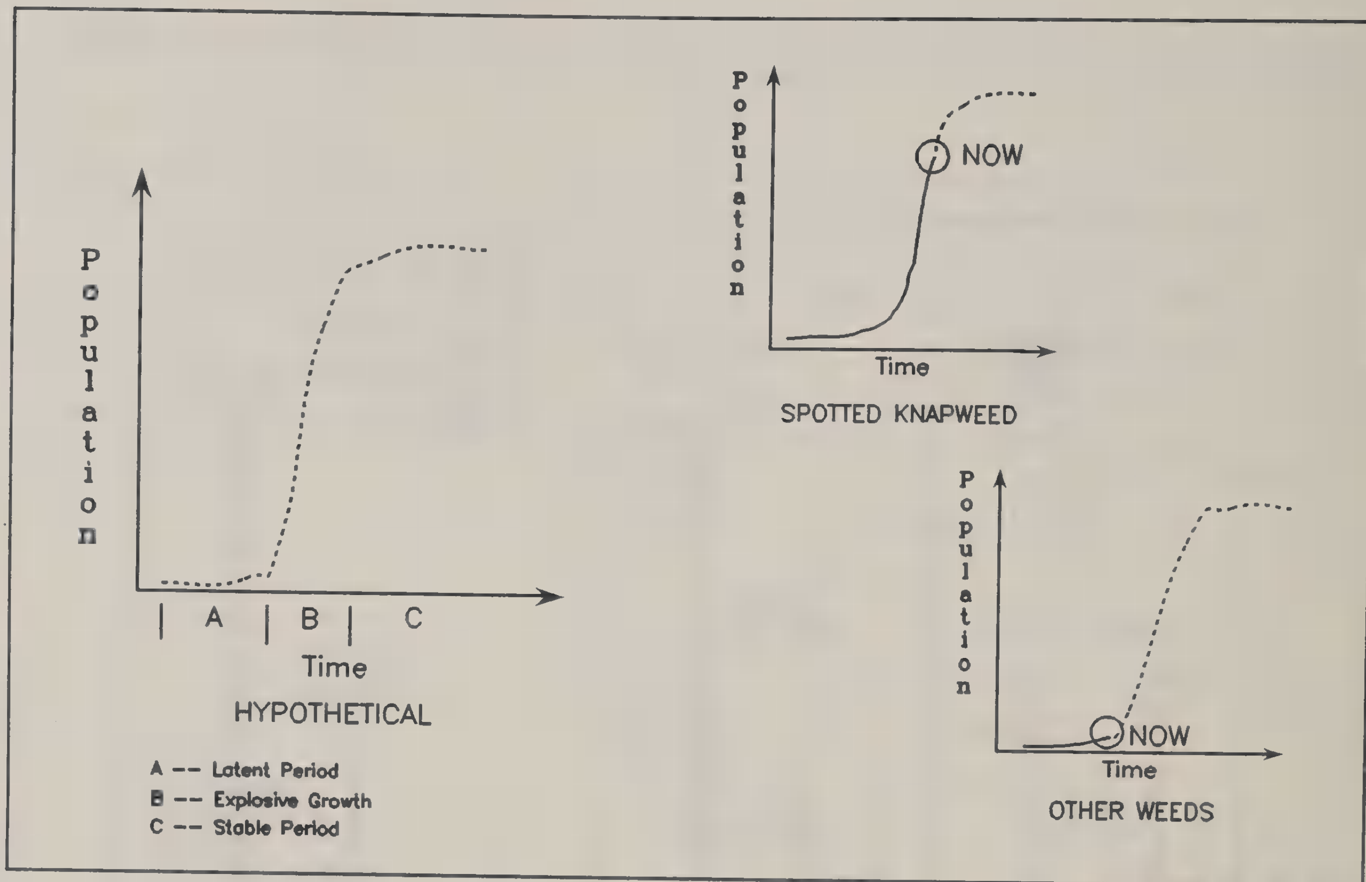


FIGURE III-5. Hypothetical Population Growth Curves

The curve on the left in Figure III-5 is a generalized "S" shaped growth pattern (also known as a "logistic curve") often seen in species that invade new environments. The horizontal axis (time) is divided into three components. First is a latent period where the species remains at relatively low population levels. The middle period is characterized by explosive population growth. Third is another relatively stable period in which the invader has reached its potential and further growth is checked by lack of additional suitable habitat or the rise of biological agents that prey on the invader.

The two curves on the right side of Figure III-5 show possible explanations for the difference seen in the earlier graphs between spotted knapweed and other weeds. Spotted knapweed seems to have passed the latent period of growth and is now somewhere in the explosive growth region of its growth curve. The other weeds are probably somewhere in the latent region of their curves, or are just entering the explosive growth phase.

Taken together, these graphs have two major implications for opportunities to control noxious weeds on the Lolo National Forest. In the case of spotted knapweed, the large acreage that already is infested and the fact that its invasion is well underway, indicate that containment or control would be very difficult. In contrast, the other weeds may be at early enough stages of invasion that control actions might still prevent them from reaching the coverage that spotted knapweed has achieved.

Threatened, Endangered, and Sensitive Plants.

The Northern Region of the Forest Service recently published a list and description of Threatened, Endangered, and Sensitive species (Reel and others, 1989). No Threatened or Endangered plants are suspected on the Lolo National Forest. Sensitive plants on the Lolo are listed in Table III-4.

TABLE III-4: Sensitive Plant List for the Lolo National Forest

Common Name	Scientific Name	Occurrence[1]
Fringed Onion	*Allium fibrillim*	?
Candystick	*Allotropa virgata*	X[2]
Sandweed	*Athysanus pusillus*	?
Peculiar Moonwort	*Botrychium paradoxum*	?
Cascade Reedgrass	*Calamagrostis tweedyi*	X
Idaho Sedge	*Carex idahoa*	?
Pale Sedge	*Carex livida*	?
Poor Sedge	*Carex paupercula*	X
Northern Golden-carpet	*Chrysosplenium tetrandrum*	?
Common Clarkia	*Clarkia rhomboidea*	X
Small Yellow Lady's-slipper	*Cypripedium calceolus* var. *parviflorum*	?
Sparrow's-egg Lady's-slipper	*Cypripedium passerinum*	?
Giant Helliborine	*Epipactis gigantea*	?
Western Boneset	*Eupatorium occidentale*	X
Northern Bastard Toad-flax	*Geocaulon lividum*	?
Howell's Gumweed	*Grindelia howellii*	X
Water Howellia	*Howellia aquatilis*	?
Keeled Bladderpod	*Lesquerella carinata*	?
Oregon Bluebell	*Mertensia bella*	X
Round-leaved Orchis	*Orchis rotundifolia*	?
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	?
Yerba Buena	*Satureja douglasii*	X
Kidney-leaved Violet	*Viola renifolia*	?

[1]**LEGEND:** X = known occurrence; ? = suspected occurrence.

[2]This plant is described in Reel and others (1989), but was not known to occur on the Lolo until after that document was published.

SOCIAL AND ECONOMIC SETTING.

The social environment affected by the Lolo National Forest's weed management program is described in Chapter III-7-14 of the Lolo National Forest Plan FEIS.

A changing social and economic environment is partially responsible for the increase of noxious weeds on private land and on the adjacent National Forests. The changes include:

- a decrease in agricultural land due to increased subdivision and marginal agricultural economics;
- the cost of weed control, particularly given the extent of the infestation, can be prohibitive to many landowners;
- accelerated timber harvest with increased road construction and site disturbance can lead to spread of noxious weeds if prevention and mitigation measures are not followed.

The increase in noxious weeds is also dependent upon the large amount of land susceptible to noxious weed invasion.

There appears to be a direct correlation between land use and the spread of noxious weeds. As land is removed from agricultural production and subdivided or left idle, noxious weeds tend to increase. The increase is attributable to the fact that farmers and ranchers typically practice weed control to increase forage or crop yield. Once the land is removed from agricultural production, there is little economic incentive to control noxious weeds. According to Census Bureau data, agricultural land in Missoula County has decreased from 373,330 acres in 1959 to 250,000 acres in 1982, a 33 percent decline. In Mineral County over the same timeframe, agricultural land has declined from 30,052 acres to 17,860 acres, a 40 percent reduction. Agricultural land has increased in Sanders County over this period.

The shifting land use, combined with highly susceptible habitats for weed establishment and spread, has led to a major increase in weeds over the past several decades. Another contributing factor is the economics of weed control. Weed spread is so pervasive that in some cases farmers and ranchers can not afford treatment necessary to control weeds. The cost of chemically treating weeds for one year can approach the value of average rangeland ($200 per acre).

There is little economic incentive to treat sub-divided land or land held idle for speculation. Even when the land is subdivided into "ranchettes", many landowners either choose not to or can not afford to treat noxious weeds. The problem is compounded by mixed landownership. The effectiveness of treatment in one area may be reduced due to spread from adjacent untreated areas.

Public interest in weeds varies depending on how individuals perceive noxious weeds affect them. Agricultural interests are concerned about reduced crops or forage. Other residents are concerned about the potential consequences of herbicides on human health and well-being. Some are concerned about displacement of native vegetation and reduced forage for big game such as elk and deer. However, given the fact that weeds are so well established, and in some cases beyond reasonable control, there appears to be a significant public tolerance of noxious weeds. Until there is a direct effect such as a reduction in deer or elk populations, or unless there is a financial incentive, a significant amount of public apathy can be expected. Increased recognition of the magnitude and potential consequences of the weed problem may stimulate more public support for weed control.

A significant social issue is public disagreement about the use of herbicides. For some people, EPA's approval of an herbicide, provided the label instructions are followed, provides adequate safeguards for human health and the environment. Other people are distrustful of herbicides including those approved for use by EPA.

The controversy is sustained by difficulty in establishing scientifically, in a way that is comprehensible and believable to concerned groups, either the presence or absence of cause and effect relationships between herbicide use and environmental damage, or between exposure to herbicides and human health problems.

This complicated scientific situation is important in three ways. In some cases, the scientific evidence may be inconclusive. Conclusive scientific analysis may not be completed for years. Also, some segments of the public may distrust or reject sound scientific conclusions because they cannot understand the analytical process leading to the conclusions, or because they have come to consider all scientific studies concerning herbicides to be inconclusive or dubious. Finally, some people criticize the fact that many studies of the health effects of herbicides are based on research with laboratory animals, whereas their direct experiences of perceived impacts on people, wildlife, and domestic animals seems to be ignored.

Therefore, questions concerning the effects of using a particular chemical, though they appear to be scientific questions, may have to be answered today in social and political terms.

Population.

Missoula, Mineral, and Sanders are the main counties in which the Lolo National Forest lies. The city of Missoula is a trade center for western Montana, and at 33,388, it is the largest city in the area (1980 census). In the 1980 census, Missoula County population was 76,016; Sanders County 8,675; and Mineral County 3,675. The population in these counties is 95 to 98 percent white.

Economy.

Forest products form the largest component of the western Montana economic base. The University of Montana, Federal Government, wholesale and retail trade, and transportation are also important components.

For the three county area (Missoula, Mineral and Sanders) that makes up the major market area of the Lolo National Forest, less than one percent of wage and salary employment comes from the Farm Sector, of which livestock is one component. Thus livestock forage from the National Forest is not of significant importance to the local economy in total.

However, livestock forage is very important to some individual users. Often a grazing allotment on national forest land is an integral part of a much larger grazing unit involving private, State and industry lands. This grazing is important for individual ranchers because they are able to remove livestock from their meadows for three to four months to produce a hay crop, thereby helping to sustain ranch operations by creating more economical units.

Lifestyles.

Though it is not a major forest activity, livestock grazing on the Lolo National Forest does furnish part-time livelihood for permittees, a majority of whom have small (less than 100 head) permits. There are a few larger ranchers who are dependent on forest forage for a significant portion of their ranching operation. These ranchers perpetuate the "old west rancher" lifestyle which is part of the valley heritage.

Other rural, agriculture-based lifestyles such as horse owners and hay or grain growers may be affected by noxious weeds.

Natural resource amenity values attract people to this region, even when employment opportunities are limited. Earnings are significantly lower here, compared with other parts of the country, reflecting a "quality of life" premium that people are willing to pay to live here. Hunting, fishing, outdoor recreation, mushroom and berry gathering are all amenities that are part of this quality of life premium.

Some people who use these outdoor amenities place high value on "naturalness," and oppose extensive use of chemicals or other intrusive management practices. Some gather wild food to reduce their intake of pesticides found in commercial foodstuffs. This natural lifestyle takes on a spiritual aspect for some, including Native Americans.

Many Native Americans practice religious and spiritual ceremonies on lands administered by the Lolo National Forest. These include such activities as vision quests, gathering traditional foods, and hunting.

Receipts and Budget.

The fiscal year 1989 budget for the Lolo National Forest is $14,000,000 to $16,000,000; the range program portion is about $125,000 (0.8 to 0.9 percent).

Total fiscal year 1988 receipts were $2,861,000, 25 percent of which was paid to the State of Montana. The grazing portion of those receipts was less than $9,000 (0.3 percent).

AFFECTED RESOURCES.

Recreation.

Recreation resources on the Lolo National Forest include: remote mountain areas served only by trails, both in and outside Wilderness; high mountain lakes that are generally small; large lakes with boat ramps, developed camp and picnic grounds, and beaches. There are many miles of roads, both hard surface and gravel, for sightseeing, hunting, fishing, dispersed camping, exploring the land and human cultural resources, and many other purposes. There are low-standard roads and trails suitable for ORV use, equestrian use, and mountain bike use. Hiking trails total 1,780 miles.

There are access points to many rivers and streams as they cross the Lolo Forest; two downhill ski areas and many miles of trails for cross-country skiing and snowmobiling. And there are three special recreation areas: the Rattlesnake National Recreation Area, Blue Mountain, and Pattee Canyon.

These and other recreation facilities on the Lolo can be thought of as either "dispersed" recreation or "developed sites." Developed sites include ski areas, campgrounds, and visitor centers. Dispersed recreation includes hiking, ORV use, driving for pleasure, hunting, and camping outside a designated campground. In 1988 the Lolo reported 267,600 Recreation Visitor Days (RVD, one person spending 12 hours) in developed sites. Dispersed recreation use was 1,299,100 RVDs in non-Wilderness areas.

Cultural Resources.

The Lolo has many cultural sites, both prehistoric and historic.

Most prehistoric sites (the remains of camp sites, rock art or other identifiable activity areas) are significant for their capacity to yield information critical in interpreting the lifeways, subsistence patterns, and social organization of peoples who inhabited western Montana for the last 10,000 years. This information is contained in artifacts such as knives, scrapers, projectile points, or other tools; in their patterning and relationship on a site; and in comparison to other sites in the area.

Generally, these sites were occupied from the last 250 years to nearly 6,000 years ago. Numerous natural processes such as freeze/thaw cycles, natural fire, and rodent activity may have affected the information potential of the sites. Nevertheless, these prehistoric archeological resources are the only information source available from which to learn about prehistoric lifeways.

Historic sites include Fort Fizzle, the Lolo Trail, homesteads, mines, the Ninemile Remount Depot, and other old ranger stations and lookouts.

Wilderness, Roadless, and Special Areas.

There are 142,052 acres of designated Wilderness on the Lolo National Forest. This includes Rattlesnake, Welcome Creek, and portions of the Scapegoat and Selway-Bitterroot. The Lolo Forest Plan recommends an additional 223,600 acres for Wilderness designation by Congress. A wilderness bill is still pending for Montana. The Lolo reported 8,700 Recreation Visitor Days of Wilderness use in 1988.

Noxious weeds are invading each of the Wilderness and proposed Wilderness areas on the forest. The weeds are spreading up trail corridors, carried by pack and saddle stock and people; they are showing up in meadows,

their seeds being dropped in livestock manure. Weeds spread out from these centers to more remote parts of the Wilderness.

Visual Quality.

All lands on the Lolo National Forest are visible to varying extents by the viewing public. Except for noxious weed species that put on massed floral displays, most weeds are visually significant only when seen within foreground viewing distances of less than one quarter mile. Primary travel corridors, including state and federal highways, major forest roads, and major forest trails have been assigned a visual quality objective of Retention for their foregrounds *(Retention is a visual qualitity objective which, in general, requires that human activities are not evident to the casual forest visitor)*. Communities, campgrounds, lakes, and rivers often have the same Retention visual quality objective. These foreground landscapes are often at higher risk to noxious weeds because of the existing ground disturbance and the introduction of weeds by vehicles, people, and stock along these corridors or activity centers.

Wildlife.

Wildlife habitats are extremely varied on the Lolo, ranging from low elevation openings dominated by bunchgrass to alpine tundra. The Lolo provides habitat for more than 300 vertebrate wildlife species. Included are nine species of big game such as moose, elk, and mountain goats; over 40 snag-dependent species such as woodpeckers and flying squirrels; and numerous songbirds, small mammals, reptiles and amphibians.

Table III-5 shows the Threatened, Endangered, and Sensitive wildlife species on the Lolo National Forest. Four species are listed as Endangered or Threatened: the grizzly bear, gray wolf, peregrine falcon, and bald eagle. Sensitive species (species which are not endangered but which have a high risk of becoming so) include the loon, boreal owl, western big-eared bat, harlequin duck, and Coeur d' Alene salamander.

TABLE III-5: Threatened, Endangered, and Sensitive Animal List for the Lolo National Forest[1]

Common Name	Scientific Name	Status
Gray Wolf	*Canis lupus irremotus*	Endangered
Peregrine Falcon	*Falco peregrinus*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Endangered
Grizzly Bear	*Ursus arctos*	Threatened
Western Big-eared Bat	*Plecotus townsendii*	Sensitive
Harlequin Duck	*Histrionicus histrionicus*	Sensitive
Boreal Owl	*Aegolius funereus*	Sensitive
Common Loon	*Gavia immer*	Sensitive
Coeur d'Alene Salamander	*Plethodon vandykei idahoensis*	Sensitive

[1]From Reel and others (1989).

Aquatic Habitat and Fisheries.

The aquatic and riparian resources of the Lolo National Forest include a diverse range of streams, lakes, wetlands, and flood plains. These are among the most valuable and most utilized resources on the forest. Aquatic habitat is characterized by an abundance of headwater streams and lakes that flow into four major rivers. Fishable populations are found in about 3,500 miles of stream and 96 lakes (5,220 acres). The forest also has many other lakes, marshes, and streams that provide habitat for an abundance of both vertebrate and invertebrate lifeforms, even though they don't have fishable populations.

Game fish of major importance on the forest include westslope cutthroat trout (*Onchorynchus clarki lewisi*), rainbow trout (*Onchorynchus mykiss*), brook trout (*Salvelinus fontinalis*), bull trout (*Salvelinus confluentus*), brown trout (*Salmo trutta*), mountain whitefish (*Prosopium williamsi*), and various hybrids of these species. In addition, at least six other game fish species and seven nongame species are thought to occur on the forest. Currently, game fish populations are relatively stable.

Vegetation management activities may affect fish populations and habitats in a variety of ways. The quantity as well as quality of the aquatic resources of the forest may be impacted by both the type and duration of various vegetative management techniques.

Threatened, Endangered, and Sensitive Fish.

The Northern Region of the Forest Service recently published a list of Threatened, Endangered, and Sensitive species (Reel and others, 1989). The two Sensitive fish on the Lolo are listed in Table III-6.

TABLE III-6: Sensitive Fish List for the Lolo National Forest

Common Name	Scientific Name
Westslope Cutthroat Trout	*Onchorynchus clarki lewisi*
Bull Trout	*Salvelinus confluentus*

Range.

Livestock grazing allotments on the Lolo occur primarily on constricted riparian areas and on transitory ranges over a wide variety of Management Areas. These two site types in combination with the presence of livestock are higher risk sites for noxious weed establishment than the general forest environment. Riparian areas support some of the most desirable vegetation to livestock. This encourages moderate to heavy livestock grazing and associated soil/vegetation disturbance. Transitory ranges have recent soil disturbance, removal of competing vegetation, increased sunlight, and recent vehicular traffic to introduce seed.

The great majority of livestock grazing on the Lolo is by cattle. The exception to this is some limited horse grazing on the Seeley Lake and Plains Ranger Districts. The forest has 53 active allotments which make available an average of 9,600 AUMs annually on about 71,950 acres of land.

The Lolo also has administrative pastures, including the Ninemile Remount Depot among others, where Forest Service packstock is kept. These operations may include winter pastures and hay-growing operations.

Timber.

Commercially important tree species on the Lolo include ponderosa pine, Douglas-fir, lodgepole pine, western larch, Engelmann spruce, grand fir, subalpine fir, western white pine, western hemlock, and western red cedar. The forest plan annual allowable sale quantity (maximum amount of timber that can be sold – on a ten-year average – while guaranteeing a perpetual, sustained yield) is 107 million board feet (MMbf). In 1988, the forest offered 86 MMbf for sale, 78 MMbf was purchased, and 64 MMbf was actually harvested.

Table III-7 shows the projected and the actual acres treated for various timber activities since the forest plan has been in effect. Timber sales have not achieved the levels projected in the forest plan.

TABLE III-7: Timber Activities (acres)

Activity	Avg. Annual Projected	Avg. Annual FY 86-88
Clearcut Harvest	3,700	1,482
Shelterwood Harvest	10,320	3,110
Selection Harvest	1,670	277
Commercial Thinning & Intermediate Harvest	200	790
Precommercial Thinning	773	1,192
Site Preparation for Conifer Regeneration[1]	-	3,296[2]

[1]This activity was not projected in the Forest Plan. Site includes removal or reduction of low vegetation and exposure of mineral soil to enhance establishment, survival, and growth of tree seedlings.

[2]Data for this item are from 1984 to 1989.

Water and Soils.

On the Lolo National Forest, soil textures range from sandy loam to clay loam, with slopes of 0 to 100 percent, and stone contents of 0 to 90 percent. Even though these extreme ranges exist, the average soil is a loam with a slope of 55 percent and a stone content of 40 percent. These soils are in various stages of vegetative cover because of timber sale activities plus 12,460 acres of bare ground tied up in roads. These bare areas will continue to provide high amounts of sediment output, water yield increases, and potential sites for weed spread. Without special management, these problems could increase as roading increases. As the forest continues to come under more intense management, the water yield for the forest will increase but the percent sediment output should decrease as additional "best management practices" are implemented.

The Lolo is rich in riparian ecosystems with 667 creeks, streams and rivers, plus 96 lakes. These riparian ecosystems are included in special management areas (MA 13 and 14) which have riparian-related goals and objectives. Tansy is the only noxious weed that is now an ecological threat to riparian systems, but the infestation probably only involves about one tenth of a percent of the total riparian habitat types on the Lolo.

Unless the riparian systems have been disturbed by grazing, mining, or other disturbance, the spread of noxious weeds has been very slow and will continue to be so because of the strong competition provided by native species. This is because of the abundance of moisture and high nutrient levels found in riparian ecosystems.

High and low flow rates for representative streams on the Lolo are shown in Table III-8. The table shows average daily flow (in cfs, cubic feet per second) for the high-flow month and the low-flow month.

TABLE III-8: Representative Stream Flows

	Low (mean daily)		**High** (mean daily)	
Stream	Month	cfs	Month	cfs
Clark Fork River[1] (3 miles below Blackfoot mouth)	January	1,500	June	9,876
Clark Fork River[1] (6 miles below Flathead mouth)	October	7,885	June	70,885
Blackfoot River[2] (6 miles above mouth)	January	548	June	5,280
Rattlesnake Creek[3] (Missoula, Ivy St. Bridge)	November	17	June	374
St. Regis River[2] (3 miles west of St. Regis)	September	135	May	2,175
Thompson River[2] (1 mile above mouth)	January	199	May	1,534
Rock Creek[4] (at mouth)	January	191	June	1,954

[1]1961 – 1985.
[2]1961 – 1970.
[3]1958 – 1967.
[4]1973 – 1987.

The Ashely Creek Watershed is used as a municipal water supply for the town of Thompson Falls. In the past, the Rattlesnake Creek Watershed has been a major municipal water source for the City of Missoula. The Rattlesnake has not been used for municipal water since a giardia outbreak a few years ago, but improved filtration systems could return this water source to municipal use in the future. Individual homes draw domestic water from several streams, lakes, and shallow aquifers on the forest.

The human health risk assessment used in this EIS (Monnig 1988) analyzed two types of drinking water reservoirs for worst-case analysis of herbicide spill accidents. The large reservoir example was 200 million gallons in size with a daily flow rate of 1.9 million gallons per day, and supplied 35,000 people. The small model was 2.3 million gallons flowing at one million gallons per day and supplying 500 people. The chain of lakes in the Seeley Valley (including Seeley Lake – 1,008 acres, Placid Lake – 1,185 acres, and Salmon Lake – 640 acres) and the reservoir on Rattlesnake Creek fall within the parameters of the two models in the health risk assessment.

Minerals.

The Lolo National Forest is in the western Montana section of the northern Rocky Mountain physiographic province. In this area, the province is characterized by northwest-trending ranges and intermontane valleys. The

Lewis and Clark Lineament, a prominent northwest-trending fault system, extends through the Clark Fork and Ninemile Valleys.

Principal rocks of the general area are metamorphosed sediments of the Precambrian Belt Supergroup. Argillaceous, silty, and sandy rocks make up the predominant lithology of the Belt, with subordinate amounts of impure carbonate rocks.

The Belt rocks have been subdivided into rock units ranging from 1,000 to 10,000 feet in thickness. In western Montana, the Belt rocks can be broken into four major divisions. In ascending order these are the Pre-Ravalli sequence, the Ravalli, Piegan, and Missoula Groups. Most of the Lolo National Forest is underlain by rocks of the Missoula Group, which consist of quartzites, argillites, and minor carbonates. However, the southeastern portion of the Forest is underlain by the Wallace Formation of the Piegan Group.

Rocks of probable Cambrian age have been mapped by workers in the vicinity of the Lolo National Forest (Hall 1968). From oldest to youngest, the Cambrian formation recognized are the Silver Hill, Hasmark, and Red Lion. These three formations have an aggregate thickness of approximately 2,700 feet in this area.

Quaternary-age unconsolidated alluvium is found in most valley bottoms. Some low-trade lignite beds are interbedded in these alluvial deposits on the edges of the valleys. Also, Pleistocene glaciation has resulted in deposition of glacial drift and lakebed sediments from Glacial Lake Missoula.

Much of the forest lies within the Overthrust Belt, a geologic province extending from Mexico to Canada. Recent oil and gas discoveries in other parts of that province have increased the interest in exploration and leasing for oil and gas in this area. As of September 1985, 920,000 acres of the Lolo were under lease, and applications were pending on an additional 290,000 acres. Since the forest plan was released, oil and gas leasing has been suspended until litigation pending in the Ninth Circuit Court of Appeals is settled, and new Federal Regulations are finalized.

Hard rock and placer mining cases have been higher than projected in the forest plan (229 cases in 1988, compared to the plan projection of 165 cases per year). In recent years, low grade gold deposits have become economically attractive because of increasing gold prices and advances in extractive methods such as cyanide heap leaching. Statistics on the acreages involved in past and current mining activities are not available now. The forest is developing a computer data base that will provide those statistics in the near future.

Lands.

The lands program reflects the complexities of an intermingled landownership pattern. Over 500,000 acres of private and State owned lands lie within the external boundaries of the Lolo National Forest. The lands program deals with rights-of-way, easements, special-use permits, donations, land exchanges, and encroachments.

The road cost share program provides continuing access to public and intermingled private lands. This is accomplished through cost share agreements, as well as grants or exchanges of road easements. Most of these agreements are with large, private industrial timberland owners, and state and county governments.

In 1988, the forest administered 567 special use permits: 83 for ditches, dams and water sources; 289 for roads; 33 for recreational residences; 75 for utility transmission and communication sites; 41 for outfitters and guides; and 46 for other uses including ski areas, resorts, and miscellaneous permits.

The land exchange program is in transition from an emphasis on consolidating scattered tracts to an emphasis on acquiring lands that compliment management objectives for existing public lands. This new emphasis

focuses on enhancing big game winter range, potential wild and scenic river corridors, public access, and recreation opportunities near rural residential developments.

Roads.

Road construction on the Lolo is generally associated with timber sales. There are currently about 6,200 miles of road under the forest's jurisdiction. Twelve percent of these roads are closed for wildlife and other resource protection, or to provide special walk-in hunting opportunities. In addition to these inventoried roads, there are about 1,800 miles of old logging spurs that were built for temporary project needs. That type of road is now commonly closed and revegetated as soon as the project is completed.

The arterial road system for the forest is nearly complete, more than three quarters of the collector system is in place. Less than one quarter of the local project road system is completed. Table III-9 shows annual miles of construction and reconstruction projected in the forest plan, and miles actually contracted in fiscal year 1988.

TABLE III-9: Road Construction/Reconstruction (miles)

Type of Road	Avg. Annual Projected	Actual FY 1988
Arterial & Collector	119	88
Local	118	92

Protection.

The protection program includes management of forest insects and diseases, and fire management, both wildfire and prescribed fire for fuel reduction and resource enhancement. The insect and disease portion is not likely to affect or be affected by noxious weeds or proposed weed control methods.

All major vegetative types on the forest evolved with frequent wildfires caused by lightening and humans. Cyclic fires play a variety of ecological roles, including seedbed preparation, nutrient cycling, maintenance of seral plant communities and wildlife habitat, temporal and spatial mosaics of vegetative types and age-classes enhancing biological diversity, and reduction in fuel loading and continuity. The listed noxious weeds tend to be pioneer plants in ecological succession, and fires often create ideal seedbeds for weed infestations. On the other hand, since the native plants evolved with fire, under the proper conditions fire may improve the ability of native plants to compete with weeds.

After logging, prescribed fire is often used to reduce the risk of wildfire (by removing fuel) and to prepare the logged site for planting or seed germination of new trees. Prescribed fires are also used to improve big game winter range forage conditions.

Table III-10 shows the acres of wildfire and prescribed fire projected in the forest plan and actually realized in fiscal year 1988. The 1988 fire season was unusually severe, and about 35,000 acres of the 240,000 acre Canyon Creek wildfire was on the Lolo. Fuels management prescribed fire was less than projected because timber sale activity was less than projected.

TABLE III-10: Wildfire and Prescribed Fire (acres)

Fire Activity	Avg. Annual Projected	Actual FY 1988
Fuels Management (prescribed)	8,944	7,943
Wildfire	2,907	41,525

Air Quality.

The air quality in western Montana is generally good. The Missoula Valley does suffer from frequent temperature inversions – particularly in the winter – and the urban area around Missoula does not meet Federal air quality standards for particulates (wood smoke and road dust) and carbon monoxide. Failure to meet these standards occurs during weather-related episodes, usually in winter.

According to the Federal Clean Air Act, all wilderness areas designated by Congress before August 8, 1977, and larger than 5,000 acres, are Class I air quality areas. This means that the pristine air quality-related values in these areas must be protected to prevent significant deterioration. The Selway-Bitterroot Wilderness and the Scapegoat Wilderness were both designated before 1977, so they are both Class I areas.

The Rattlesnake and Welcome Creek wildernesses – both were designated after 1977 – along with the rest of the Lolo National Forest are in Class II for air quality. This means that moderate deterioration in air quality may be allowed under the Clean Air Act.

CHAPTER IV – ENVIRONMENTAL CONSEQUENCES

Chapter IV.

ENVIRONMENTAL CONSEQUENCES

This chapter provides the analytical basis for comparing the alternatives in Chapter II. The environmental elements presented in Chapter III are analyzed here for effects they may have on, or ways they may be affected by, the following four factors:

- ☐ Effects of Weeds;
- ☐ Effects of Herbicides;
- ☐ Effects of Physical Weed Control;
- ☐ Effects of Biological Weed Control.

The effects quantified in this chapter should be treated as relative, rather than absolute. They were developed to compare alternatives and provide a reasonable basis for choice between them. These effects are upper-bound estimates, assuming that each alternative would be fully funded and implemented. Actual implementation levels would probably be at or below the levels projected in this EIS.

There are ten main sections in this chapter:

- **Human Health and Safety;**
- **Vegetation and Ecological Integrity;**
- **Resources;**
    - Recreation
    - Cultural Resources
    - Wilderness, Roadless, and Special Areas
    - Visual Quality
    - Wildlife
    - Aquatic Habitat and Fisheries
    - Range
    - Timber
    - Water and Soils
    - Minerals
    - Lands
    - Roads
    - Air Quality;
- **Summary of Impacts by Alternative;**
- **Unavoidable Adverse Impacts;**
- **Short-term Uses and Long-term Productivity;**
- **Irreversible and Irretrievable Commitment of Resources;**
- **Possible Conflicts with the Plans or Policies of Others;**
- **Energy Requirements;**
- **Cumulative and Connected Actions.**

HUMAN HEALTH AND SAFETY.

Effects of Herbicides.

The Forest Service Northern Region recently completed a human health risk assessment for several herbicides used in noxious weed and poisonous plant management (Monnig 1988). That analysis is summarized in Appendix G, and the entire document is incorporated by reference into this EIS. This section will summarize the Northern Region human health risk analysis.

Five project scenarios representing a range of project types, and several major accident/spill scenarios are analyzed in the Northern Region assessment. One of the project scenarios covers aerial spraying, so it was not reviewed for this EIS. The remaining four project scenarios are listed below:

- Open range/forest, ground application, 1 acre;
- Open range/forest, ground application, 40 acres;
- Open range/forest, ground application, 500 acres;
- Road right-of-way/riparian application, 20 acres.

The major accident scenarios involve truck accidents resulting in spills of conentrated herbicide on workers or into reservoirs used for drinking water.

The Northern Region assessment is a "worst-case analysis" employing several conservative assumptions that tend to overestimate the likelihood and severity of exposure, accidents, and resulting effects. Those assumptions include: higher application rates than proposed in this EIS; continuous application over an entire project area, rather than the spot application generally proposed; mixing and application errors that would not generally occur; residences and food sources much closer than would occur in most projects; dermal exposure estimates for workers failing to wear recommended protective clothing; and that there is no threshold or safe level for exposure to carcinogens.

Potential health risk is further overestimated by comparing long-term acceptable exposure levels to short-term, single event exposure. For instance, the U.S. Environmental Protection Agency (EPA) sets human Acceptable Daily Intake (ADI) levels for the maximum dose of substance that is anticipated to be without lifetime risk for daily consumption. Theses ADIs are generally set using a safety factor of 100 times the No Observed Effect Level (NOEL) for the most sensitive known species. The Northern Region assessment compares short-term exposure to these long-term safety levels. Doses received over one to a very few days are compared to safety levels set for continuous daily doses over a lifetime.

Data gaps do exist and further studies are underway for health effects from all three herbicides considered in this EIS, particularly in regard to carcinogenicity. The Northern Region health risk analysis uses worst-case assumptions whenever these data gaps were found.

Much of the existing cancer risk data are based on models that extrapolate animal studies to humans using models that incorporate safety factors to overestimate human effects. These models also use short-term, high doses instead of the long-term, lower doses that more likely comprise human exposure to carcinogens.

Toxicology.

Unlike DDT and some other well-known pesticides, picloram, 2,4-D, and glyphosate do not bioaccumulate or biomagnify. Animals high on the food chain (humans, eagles, wolves) are not expected to acquire concentrated

doses of these chemicals by feeding on contaminated plants or animals. These herbicides are water soluble, generally are not lipid soluble (they won't concentrate in fatty tissues), and they are excreted quite rapidly.

For the general population (non-workers), all worst-case scenarios result in doses that are well below known NOELs. Only a couple of cases involving improbable events would exceed ADIs – a person consuming large amounts of unwashed, recently sprayed vegetation, and an adolescent spending an entire day in a right-of-way 2,4-D spraying project. In both these cases, doses would be short-term and would be far below NOELs. See Appendix G and Monnig (1988) for further discussion.

A very small percentage of the population may be hyper-sensitive to one or more of these chemicals. While the condition seems to be very rare, those that have it can suffer severe and long lasting symptoms after relatively small doses. Prevention of exposure is key to minimizing this risk.

Workers are at highest risk, especially those using backpack spray equipment. For picloram and glyphosate, all worker dose estimates are well below NOELs, and ADIs would be exceeded only by workers using backpack sprayers and failing to wear recommended protective clothing.

All workers using 2,4-D could exceed ADIs. Worst-case scenarios for workers not wearing protective clothing indicate that those workers could possibly have exposures approaching NOELs, and thus might be at some risk to effects on kidney function. Use of proper application methods and protective clothing can reduce this risk.

Risk of Cancer and Mutation.

Table IV-1. One-In-A-Million Risks of Cancer Death

Source of risk	Type and amount of exposure
Herbicide Worker[1]	2,4-D: 137 days picloram: 11,236 days glyphosate: 41,667 days
Cosmic rays	One transcontinental round trip by air; living 1.5 months in Colorado compared to New York; camping at 15,000 feet over 6 days compared to sea level.
Eating & drinking	40 diet sodas (saccharin) 6 pounds of peanut butter (aflatoxin) 180 pints of milk (aflatoxin) 200 gallons of drinking water from Miami or New Orleans 90 pounds of broiled steak (cancer risk only)
Smoking	2 cigarettes
Other	20 days of sea level natural background radiation; 2.5 months in masonry rather than wood building; 1/7 of a chest x-ray using modern equipment.

[1]Assumes backpack spraying, average dose, and recommended protective equipment and procedures.

Although human carcinogenic risk levels for these three herbicides appear to be quite low, scientific uncertainty still exists regarding the exact level of these risks.

Animal feeding studies indicate that carcinogenic effects for picloram, 2,4-D, and glyphosate are very weak to non-existent – perhaps on the same order as saccharin. Recent human epidemiological studies (studies of relative rates of disease in populations that have been exposed at different levels to potential disease-causing

agents) of 2,4-D have suggested that workers exposed to 2,4-D might have elevated cancer risks. However, these epidemiological studies have had inconsistent results. EPA has reviewed these studies and has decided that there is no need to further restrict the use of 2,4-D at this time. Additional studies are underway. Although inconclusive, the results of 2,4-D studies to date argue, at a minimum, for care in the use of 2,4-D to reduce exposure, particularly to workers.

Based on the extrapolation of the results of animal cancer studies to humans, it is again apparent that workers are at highest risk. A lifetime of 2,4-D exposure (assuming 30 days of application per year for 30 years) could increase the worker's chances of getting cancer by about five chances in 100,000. Since the average American has about one chance in four of cancer regardless of herbicide exposure, this cancer increase is still rather small. Picloram and glyphosate are 10 to 100 times less potent carcinogens than 2,4-D based on animal feeding studies. Thus, comparable doses would result in proportionately less cancer risk.

Cancer risks to members of the general public are 100 to 1,000 times less than the risk to workers when considering exposure to the same herbicide. Risks on this order could not be detected by epidemiology studies as conducted by the National Cancer Institute.

Synergistic Effects.

The possible interaction of pesticide active ingredients with other chemicals in the environment has been raised as an issue. Of particular concern is the possibility of synergism, a special type of interaction where the combined effect of a specific herbicide with one or more chemicals in the environment (such as pollutants) would be greater than the sum of the individual effects of the herbicide and chemical(s) (in other words, 2 + 2 are greater than 4).

A classic study of the synergistic effects of pollutants examined the interactive effects of asbestos exposure and smoking. This study found that inhalation of cigarette smoke and asbestos resulted in an eightfold increase in lung cancer over nonsmokers exposed to asbestos. Studies such as these, however, have limitations because high doses are required to discover effects and the relevance to low-level exposures is uncertain.

No synergistic effects are known.

Inert Ingredients.

In the process of formulating pesticides for commercial use a variety of surfactants, emulsifiers, diluents, and other so-called inert ingredients may be added. The toxicological properties of these additives have come under increased scrutiny. EPA has issued two lists of inerts requiring further regulation or testing. The first list of about 55 chemicals groups the "Inerts of Toxicological Concern", and a second list of 60 chemicals are "Potentially Toxic Inerts/High Priority for Testing."

Some formulations of 2,4-D contain petroleum distillates, a class of chemicals found on List 2. Analysis of the health risk of these petroleum products indicates that these inerts pose less risk than the active ingredients. Tests of the acute toxicity of pesticide formulations support this contention. The LD_{50} values for the pesticide formulations are typically higher than those of the active ingredient, indicating that the formulations are less toxic. Unfortunately, chronic tests of pesticide formulations are not available and interactive effects on cancer rates or other health effects cannot be ruled out absolutely.

Cumulative Effects.

The additive impact of Lolo National Forest spraying relative to the effects of the private application of herbicides would be very small. For example, a worker or farmer who sprays herbicides on non-Forest Service projects and is also a resident in the vicinity of Forest Service projects might expect, under worst-case conditions, an increase in herbicide dose of about 1 percent over his worker dose. Typically, the increase would not be measurable.

The total doses to members of the general public from all sources of herbicides are unlikely to be higher than those estimated in these analyses. The dose to maximum-exposed residents assumed that the greatest portion of their diet came from spray-impacted foodstuffs. Any substitution of food from other sources (i.e., food markets) would lessen the dose. The herbicides involved in these analyses have not been found widely in market foodstuffs. For example, a market-basket analysis by the Natural Resources Defense Council (NRDC) of a variety of fruits and vegetables found no 2,4-D in any food sample.

Although the NRDC found other pesticides in some foodstuffs, the interactive effects would be suspected to be small for maximum-exposed residents. Dr. Bruce Ames, an eminent toxicologist from the University of California at Berkeley, has pointed out that there are many naturally occurring chemicals in the food that people eat that are teratogenic, mutagenic, and carcinogenic, and which are consumed at doses 10,000 times higher than man-made herbicides (see discussion in Ames 1983). Therefore, the low, short-lived doses to maximum-exposed residents that result from spraying of these herbicides are very small compared to many other chemicals in the environment. For these small comparative doses, a synergistic effect is not realistically expected.

Major Accident Scenarios.

An examination of accident records for the past 10 years reveals no major accidents involving herbicide application projects. The possibility of accidents in the future cannot be completely discounted, however. Worst-case scenarios involve spills from tank trucks with mixed herbicide loads into drinking water reservoirs. However, most drinking water in the area comes from wells or unroaded drainages.

Several accident types, including spills of concentrated herbicide formulations onto people or into drinking water reservoirs, are reviewed in the Northern Region Health Risk analysis. Spills of concentrate onto people could cause acute effects including nausea, trembling, headache, etc., depending on the degree of exposure, time to cleanup, and individual factors.

Spills into drinking water reservoirs would present less risk to individuals primarily because relatively little herbicide is carried at any one time and any spilled amounts would be quickly diluted. Monnig (1988) modeled two reservoir sizes: a large reservoir of 200 million gallons, flowing at 1.9 million gallons a day serving 35,000 people; and a small reservoir of 2.3 million gallons flowing at one million gallons a day serving 500 people. (Lakes and reservoirs used or potentially used for drinking water near the Lolo fall with the parameters of these two hypothetical reservoirs). Concentrations in the larger reservoir would never be high enough to exceed ADI levels. In the small reservoir, drinking water ADI levels could be exceeded for less than one day following a worst-case herbicide spill.

The calculated probabilities for these accidents is quite low. For the entire Northern Region (assuming 1,220 projects per year), truck spills involving herbicides had calculated probabilities ranging from five every 1,000 years to one in 2,400 years. The probability of such accidents involving drinking water reservoirs were conservatively calculated at one accident every 34,000 years. Risk on the Lolo would be far less one in 34,000 years because even under Alternative E, annual projects would number far fewer than 1,220.

Effects of Biological and Physical Control.

Neither of these control methods poses any risk to the health and safety of the general public. Workers would be exposed to the same types of accident and injury risks that anyone working outdoors with mechanical equipment or animals faces.

VEGETATION AND ECOLOGICAL INTEGRITY.

Ecological Integrity.

Effects of Weeds.

The ecological integrity of a plant community is dependent on excluding non-native plants and or animals and maintaining the native species in their relative position in the community. Also important are the natural perturbations that influence community structure, such as fire which allow normal successional change to occur. Plants or animals not native to the community will change this natural balance that has developed over time causing changes that may be far reaching. For example, numerous plants such as timothy are well established and used extensively for revegetation work. This plant, even though considered desirable from a forage or cover standpoint, is just as detrimental to the ecological integrity of a community as a noxious weed. Another example is bluegrass, which forms near-monocultures in some of our riparian zones and has a significant impact on the ecological integrity of those communities.

Because of our planned and unplanned introductions of exotic plants, most of our forest communities which are at risk to weed invasion are no longer "pure," even though they may not have noxious weeds present. For this reason, the evaluation of noxious weed impact on ecological integrity is somewhat moot, and weed introduction represents only another step in degrading the integrity of a site. Noxious weed impacts become a matter of degree since ecological community disruption may also occur with desirable plant species.

Spotted knapweed. The majority of the expansion of spotted knapweed will be in the dry vegetative communities where knapweed is very competitive and can displace native vegetation. Over time, particularly when impacted by livestock grazing, many of these communities move toward monocultures with a resultant loss of forage value, and destabilizing and potential loss of the native community. To date these monocultures of spotted knapweed have been relatively stable as predators and pests from their native area are not present. Recent studies suggest that there is a significant nutrient drain under dense stands of knapweed which influences the present vegetation as well as retarding recovery of the native community, even with knapweed removal.

Diffuse knapweed. The problems associated with diffuse knapweed are similar to spotted knapweed only on a much smaller scale. Many of our sites appear to be on the edge of the range for diffuse knapweed and it is not as aggressive in dominating the natural community.

Canada thistle. The impact of this weed is generally transitory in a forest environment. It can dominate the vegetation for a period of generally less than five years, at which time it gives way to the native vegetation. Livestock grazing, however, can influence recovery by removing competing vegetation, allowing Canada thistle to persist for extended periods.

Musk thistle. This weed is not a problem in a forest environment except along road shoulders. In moderate to heavily grazed grasslands, musk thistle may occupy a significant portion of the vegetation, however, these conditions have not been noted on the Lolo.

Goatweed. Goatweed's impact on community integrity over the long run is more significant than knapweed's. The plant is a perennial and can persist under a forest canopy for an indefinite period. In grassland communities goatweed readily forms monocultures, even crowding out knapweed. Examples of this condition can be found on forest lands and they are expected to enlarge.

Houndstongue. While houndstongue can establish on many different sites, it generally requires livestock activity to maintain a significant presence. Ground disturbance is necessary for this biennial to persist, and when

cattle are removed from an infested site, houndstongue plants can still be found where gopher activity provides a seed bed. Houndstongue will not form monocultures and for this reason has little effect on the integrity of the natural community. With removal of livestock, the density of the plant normally will be reduced so only occasional plants survive.

Leafy spurge. This species represents the greatest threat to ecological integrity because of its persistence. It is a perennial and can maintain itself under forest shade. Like goatweed, it can out-compete knapweed and form monocultures. Once established there is little that can be done to eliminate it from the community. Present infestations are expected to enlarge and increase the impact on the drier community types.

Tansy. While suitable sites for tansy establishment are somewhat limited, it can readily dominate those sites. It is a particular problem in the riparian zone. These sites are normally very complex vegetatively because of the available moisture and good soils. However, tansy can form monocultures and eliminate many species, even under a forest canopy. Continued expansion of these infestations will continue the degradation of our riparian zones.

Dalmatian toadflax. While toadflax can be a serious threat to dry grasslands, most of the upland sites on the forest are outside the optimum range for this plant. Single plants or clumps may be common on a site, but it is not aggressive enough to dominate these upland sites. The plant will be of most concern at lower elevations in the large river valleys which are generally in private ownership.

Effects of Herbicides.

While 2,4-D and picloram may reduce noxious weeds, they also kill native forbs and shrubs, decreasing natural diversity at least for the short-term. Grasses are tolerant of these herbicides and would benefit from treatment. Glyphosate can kill all vegetation, which could provide a seedbed for re-establishment of weeds and other disturbance-oriented plants. All chemicals would destabilize natural communities on treated sites, but reduction or elimination of weed spread could offer some degree of off-site protection for native communities.

Effects of Physical Control.

Physical control will normally have limited impact on ecological diversity. During grubbing and pulling treatment, some desirable plants may be impacted. Mowing can reduce top growth or seeding activity of native plants.

Effects of Biological Control.

The USDA Animal and Plant Health Inspection Service screens biological control agents and prepares Environmental Assessments to ensure that imported agents will not affect native plants. The agents proposed in this EIS are already widespread and no negative effects have been reported. Some secondary impacts could occur as a result of population changes in predator species which may utilize the biological agent as a food source. For example the larvae of the spotted knapweed gall fly is being used by small rodents as a food source. If this change in food supply increases rodent numbers, both positive and negative impacts would be possible. Increased rodent feeding and burrowing activity could affect native plants, but could also increase the food supply for raptors and other rodent predators.

If not properly managed, goat grazing could harm ecological integrity. Goats prefer shrubs for feeding and can severely impact certain plants if allowed to graze in one place for a long period. Herding and movement should prevent these impacts.

Sensitive Plants.

Effects of Weeds.

Weeds are normally very competitive and may have an adverse impact on sensitive plants by crowding them out. The risk to the following plants is high because the environment in which they are located is suitable for the weeds discussed in this EIS. They are: *Clarkia rhomboidea, Grindelia howellii, Lesquerella carinata* and *Athysanus pusillus*. Plants with a lesser threat are *Orchis rotundifolia, Allotropa virgata* and *Satureja douglasii*. Tansy may be a threat to plants that occur in moist riparian environments such as *Athysanus pusillus, Epipactis gigantea* and *Orchis rotundifolia*. The remaining species on the sensitive plant list occur in habitats that are generally not suitable for extensive weed development. Of the sensitive plants just mentioned, only the following are known to occur on the Lolo:

- ***Clarkia rhomboidea,***
- ***Grindelia howellii,***
- ***Allotropa virgata,***
- ***Epipactis gigantea*** and
- ***Satureja douglasii***.

Effects of Herbicides.

Commonly, sensitive plants occur as one individual or a small group of plants. Use of herbicides in areas containing sensitive plants can cause significant loss in total numbers and potentially eliminate the plant from the site.

Effects of Physical Control.

The major impact from physical control is associated with disturbance of sensitive plants by activity adjacent to them. Mowing can impact potential seed production or cause loss of plant vigor due to topping plants.

Effects of Biological Control.

The two proposed insect agents are not known to have any effect on sensitive plants. If not properly managed, goat grazing could be harmful to sensitive plants.

RESOURCES.

Recreation.

Effects of Weeds.

Evaluation of weed effects on recreation will estimate the effect of each of the nine weeds upon the following resources:

- ☐ Developed Recreation Sites;
- ☐ Areas of Concentrated Recreation Use;
- ☐ Dispersed Recreation Sites;
- ☐ Aesthetics;
- ☐ Wilderness.

Noxious weeds can adversely affect most recreation activity on the forest, but many of the activities are affected minimally, and only for recreation users who are very aware of weeds. Some recreation users could be affected by chemical weed control.

Spotted Knapweed.

☐ ***Developed Sites*** – In campgrounds, picnic grounds, boat launch sites, downhill ski areas, and visitor centers, invading weeds can detract from the desirability of the site. Near campsites or on beaches adjacent to lakes and rivers, knapweed can diminish the usefulness of the site because the stiff plant stocks discourage walking bare-foot or siting on the ground. Weeds on ski trails are less desirable for holding soil in place than grasses. The stiff stocks do not lay down in the fall, later sticking up through the snow adversely affecting skiing conditions.

While spotted knapweed can be undesirable in these sites, because most sites are in habitat types with tree cover, spotted knapweed density generally does not seriously affect the recreation experience. Open areas and beaches do require weed control to maintain a high quality recreation site. Occasionally, developed recreation sites may have severe knapweed infestations that are barriers to recreationists or that affect bare-footed water recreationists. Allergies of recreationists can also be affected during knapweed bloom. Under no action, the situation in these sites will not change significantly in the next ten years.

☐ ***Areas of Concentrated Use*** – Spotted knapweed has affected these sites by reducing the desirability of meadows and open areas for people to walk through or sit in the grass or have a picnic in the meadow. Areas adversely affected include Blue Mountain, Patty Canyon, Rattlesnake NRA, and Rock Creek. The habitats that are at risk are occupied now so there would be little change in the next ten years under no action.

☐ ***Dispersed Sites*** – Along roadsides, trails, in meadows, and in the general forest, noxious weeds detract from recreation experiences by degrading: aesthetics, the good feeling of walking through a grassy meadow, and variety and amount of flowers and native flora the recreationist observes.

Trailheads and trails on the Lolo are often located in habitats at high risk to weed infestation. These are richly supplied with seed from vehicles, people, and livestock so that the sites can be heavily infested with spotted knapweed. The weed does not make the site unusable for its recreation purpose. Sites at high risk and moderate

risk are already infested and no additional impact is expected over the next ten years. However, infested trailheads can be seed sources where stock and vehicles may pick up seeds and spread them to other areas.

☐ ***Aesthetics*** – Wherever spotted knapweed is invading meadow grass, beach sand, or native forbs, it is having an adverse effect on the aesthetic values. It is less desirable to walk through than most native vegetation and detracts from the recreation experience. The adverse effect on aesthetics will probably not increase significantly in the next decade because most of the susceptible sites near roads and recreation areas are already infested.

During the flowering season, many people find spotted knapweed attractive, so aesthetic effects are not entirely negative.

☐ ***Wilderness*** – Wilderness represents an opportunity for native ecosystems to operate as independent of man's influence as possible. Spotted knapweed is a serious threat to Wilderness values because it replaces natural vegetation, it is not native to our Wilderness, and to keep the weed out requires intensive management within the Wilderness Area. Spotted knapweed can be a stark reminder to the Wilderness user that he/she has NOT escaped the influence of man.

Diffuse Knapweed.

Diffuse knapweed is found in small patches on the Lolo. It is relatively easy to recognize, so it is reasonable to expect infestations in all recreation areas and Wilderness could be found and treated very quickly. It also has a relatively restricted range of suitable habitat types on the Lolo. For these reasons, diffuse knapweed is not expected to become a major invader of recreation areas or Wilderness in the next decade.

Tansy.

Tansy likes to be around water and along roads, just like people do, so it can have an adverse effect on recreation users.

☐ ***Developed Sites*** – Where these sites are associated with riparian areas or in areas of high precipitation, tansy can form a significant barrier to movement of recreationists. Under no action, this weed can be expected to spread along riparian areas.

☐ ***Area of Concentrated Use,*** ☐ ***Dispersed Sites,*** and ☐ ***Wilderness*** – Tansy is not a significant adverse factor for recreationists. This situation will probably not change in the next ten years.

Musk Thistle, **Houndstongue**, **Dalmatian Toadflax**, and **Canadian Thistle.**

☐ ***Developed Sites,*** ☐ ***Dispersed Sites,*** and ☐ ***Areas of Concentrated Use*** – These noxious weeds occur in small patches. These weeds are not a problem now and are not likely to become a problem in the next ten years on these recreation sites.

☐ ***Wilderness*** – These weeds can be controlled mechanically, and with other management actions compatible with Wilderness management. Educating Forest Service employees and the public to recognize these weeds and pull them could keep infestations from occurring in Wilderness now and in the future.

Goatweed.

☐ ***Developed Sites,*** ☐ ***Dispersed Sites,*** and ☐ ***Areas of Concentrated Use*** – Goatweed is a threat to grassy meadows, so it can have an adverse impact on recreation experiences in meadows. The goatweed beetle is apparently the best chance for control because mowing or pulling seems to increase the weed. Even with the use of the beetle, goatweed can be expected to increase in recreation areas and have an adverse effect on

aesthetics and the general recreation experience. Goatweed can be expected to increase in recreation areas over the next ten years.

☐ ***Wilderness*** – Goatweed is invading Lolo National Forest Wilderness by following its way up the trail system, occupying the dry sites along the way. The effect is to detract from the Wilderness experience and replace native vegetation. Under no action, goatweed can be expected to expand its range in Wilderness and occupy meadows that are now grass. In ten years goatweed can be expected to be more visible to the traveler and cause some grazing problems in Wilderness.

Leafy Spurge.

☐ ***Developed Sites,*** ☐ ***Dispersed Sites,*** ☐ ***Areas of Concentrated Use,*** and ☐ ***Wilderness*** – Leafy spurge is invading all recreation sites located in high risk habitat groups. Most of the recreation sites on the Lolo are in high risk habitats. Many of the trail corridors and camp sites in Wilderness are also within high risk habitats. Long-term control of leafy spurge is not possible at this time. To reduce the spread requires aggressive action. Future biological control seems to be the best possibility for eventual control of leafy spurge. This weed can be expected to increase in the next ten years, having an adverse impact on recreation sites and Wilderness by replacing native vegetation and reducing forage.

Effects of Herbicides.

Using herbicides to control noxious weeds would result in a more pleasant recreation site but people would recognize that chemicals had been used. Some people are comfortable with the use of pesticides around the home, garden and intensively managed recreation sites like golf courses. Others would want to avoid chemically treated areas, so an herbicide treated site would actually have reduced value for some.

Effects of Physical Control.

Mowing or pulling weeds would have little to no effect on recreation, except for reducing the impacts of weeds. These measures would be concentrated on roadsides and developed sites where such practices are common and accepted.

Effects of Biological Control.

With insects, there would be no anticipated adverse effect on the recreation resource, and there could be significant long-term benefit in reclaiming forest meadows and hillsides with native vegetation. Most recreationists would not notice the insects. Grazing, on the other hand, could have negative effects associated with trampling around wet areas, and the presence of animals and their feces on recreation sites. Some people might object to the smell, could be concerned about their small children, or might have dogs that would interfere with grazing animals.

Cultural Resources.

Effects of Weeds.

The effects of noxious weeds on Lolo National Forest cultural resources range from essentially no impact to a genuine "adverse effect" on some historic sites where the setting and historic vegetation is a critical element.

The presence of noxious weeds on or near most prehistoric archeological sites would have no effect on the information potential and hence the scientific values of the site.

For some historic sites – where vegetation is a key element contributing to the integrity of the site – the presence of noxious weeds is an obvious intrusion and possibly an adverse effect. An example is Fort Fizzle on the Missoula District near the mouth of Lolo canyon. Fort Fizzle played a role during the Nez Perce war of 1877. It was a log breast work constructed by soldiers and citizen volunteers to stop the Nez Perce during their flight from Idaho. Originally, the fort was built on a bench timbered with mature ponderosa pine with an open grassy meadow to the west. Prior to the Lolo Creek Wildfire in August 1988, the formerly open bench was filling in with conifers and spotted knapweed. Because spotted knapweed is an exotic plant introduced to western Montana in the early 20th century, it is a definite vegetative intrusion to the historical integrity at Fort Fizzle. A similar situation exists at other historic sites such as homesteads, and early Forest Service administrative sites such as ranger stations and work centers.

Effects of Control Methods.

Physical, biological, or chemicals controls would have no negative effect on prehistoric or historic sites. Reducing exotic plants could restore and protect the visual quality of some historic sites.

Noxious weed control project planning should consider Native American practices on the forest. If chemical controls are considered, the respective Native American cultural committees (Salish, Kootenai, and Nez Perce) should be consulted well in advance. This issue was raised in June, 1988, at the Blue Bay Conference hosted by the Salish Cultural Committee. Much of the concern expressed by the Native Americans present centered on the introduction of toxic chemicals to traditional food-gathering areas – a health and safety factor from their point of view. Another concern was the introduction of toxic or foreign chemicals into areas that may have religious or spiritual significance to "traditional" tribal members.

Wilderness, Roadless, and Special Areas.

Section 2(c) of the 1964 Wilderness Act gives the following definition:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, . . . an area of undeveloped Federal land retaining its primeval character and influence, . . . which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable . . .

The presence of non-native, aggressive weeds replacing native species in some of the most visible sites is an adverse effect on the Wilderness resource. Noxious weeds also can have an adverse effect on the recreation user who is aware of plants, wants to enjoy the native flora, and is reminded of mankind's impacts by the presence of spreading noxious weeds.

Any weed control measures that reduce weeds in Wilderness would have positive impacts. However, the proposed control methods could also have negative impacts on the native flora. See the comments above in the vegetation and ecological integrity section for further discussion.

See the comments under the recreation section for other recreation-related Wilderness effects.

Visual Quality.

Effects of Weeds.

Noxious weeds typically affect the immediate foreground, rather than middleground and background, except where plant masses are large enough, as in the case of knapweed and leafy spurge, to create foreground and middleground flowering displays and, in the case of leafy spurge, fall color.

Visual effects can be both positive and negative. Negative effects of weeds are largely limited to the foreground, where plants may be out of scale, visually out of place, and often associated with land disturbance activities. At the same time, to those unaware that they are looking at noxious weeds displacing native materials, flowering knapweed, leafy spurge, goatweed, dalmatian toadflax, and tansy may appear as attractive components of the landscape.

Landscapes where noxious weed impacts are of greatest visual concern are those seen by the most viewers: foreground Retention and Partial Retention road sides, trails, riparian areas, and grassy meadows. Additionally, developed and dispersed recreation sites, which provide opportunities for prolonged viewing of the landscapes by pedestrians, are very susceptible.

Theoretically, the cost to landscape quality due to noxious weeds could be measured in terms of a lessened visual experience. Where the plants are so annoying that recreationists and others alter their itinerary to avoid them, dollar costs could be calculated if studies were available that documented such behavioral changes. Recreation Visitor Days lost could also be a measure of these impacts. No such studies are known.

Knapweed and Canada thistle patches may presently cause some people to avoid certain previously used areas because of the barrier effects of these plants. The impacts of other noxious weeds are probably not significant enough, yet, to be able to measure their costs to the landscape viewing part of the recreation experience. We're unable to measure costs per acre of benefits lost, although the long term effects decades from now would be considerable for the forest as a whole if noxious weeds are not kept in check.

Below are individual species comments as they relate to recreation and visual impacts:

Spotted and Diffuse Knapweed can cause a negative impact on foregrounds, especially where occurring in dense stands that preclude other native vegetation. The taller the stand, the greater the visual impact can be. Flowering masses can be attractive, but the rough, dead tops are unattractive compared with native vegetation. Other wildflowers may be greatly curtailed by knapweed.

Canada Thistle and Musk Thistle. For whatever reason, thistles never seem to visually belong and are visual intrusions, appearing especially obtrusive during seed dispersal. Most publics would readily recognize them as an undesirable noxious weed. It has a gawky, out of scale appearance and is a formidable barrier plant especially unwanted at recreation sites. Riparian and readily visible logged-over areas are especially impacted and often readily visible by motorists. Fortunately, the scale of such logging is reduced in the Retention and Partial Retention foregrounds.

Goatweed. This is a visually attractive plant capable of providing interesting flowering displays, but its ability to out-compete grasses can make it visually undesirable. Its habitat of meadows and grasslands are readily open to view.

Houndstongue. A visually unobtrusive plant, it can bother recreationists walking through it and collecting the seeds on their clothing.

Leafy Spurge. A showy plant in masses, this weed provides massed flower and foliage displays attractive to most publics, unless they're aware of its status as a noxious weed. These are visible in the foreground and middleground.

Tansy. An attractive plant when green and flowering, tansy adds color to riparian landscapes, but is highly competitive with native vegetation. Dead stocks from previous years' growth can be unattractive, and may act as a barrier in riparian areas.

Dalmatian Toadflax. Another showy flower, it seems to provide visual variety and offers little threat to the forest, being located primarily on valley floors.

Effects of Herbicides.

Herbicides can cause a short term visual impact when sprayed vegetation turns brown. Selective herbicides like picloram and 2,4-D will kill or burn broadleaf plants, leaving grasses largely unaffected. Broad spectrum herbicides like glyphosate will brown or kill all vegetation.

Effects of Physical and Biological Control.

There would be essentially no visual impacts other than the dead plants that might remain to litter the landscape after mowing or grubbing.

Wildlife.

Effects of Weeds.

Big Game and Predators. Issue #2 (page I-6) can be divided into two wildlife sub-issues relating to the spread and control of noxious weeds. These are: 1) what effects do noxious weeds have on big game populations due to losses in winter range forage? and 2) what effect might chemical control have on wildlife populations from direct consumption of treated vegetation or secondary consumption by predators eating contaminated prey?

Information needed to assess the big game issue includes: ■ what is the **current population** of big game on the forest and adjacent lands? ■ how much **winter range** is at high risk for weed invasion? ■ what are the current and projected (under no action) **forage production losses** due to weeds? ■ how much **forage production** could be **regained through control action**? ■ during a representative winter, how **dependent** are animals **on winter range and spring greenup grass forage**? ■ how much **knapweed utilization** occurs on winter ranges? ■ at the Forest Plan desired big game population level, is there **surplus winter range forage**? ■ how will **weed densities** change over time?

Current Population. Elk and whitetailed deer numbers have increased substantially since 1979. About 12,500 elk now inhabit the Lolo National Forest and immediately adjacent lands.

Winter Range. The area of winter range is difficult to calculate since the upper boundaries expand or contract due to the severity of a given winter. The Forest Plan data base listed approximately 350,000 acres of potential winter range from which to select winter range management areas.

Losensky (1987) lists those habitat types where total or near total conversion to spotted knapweed or leafy spurge is possible. These habitat types occur on about 48,000 acres of winter range, 14 percent of the total potential winter range. The best represented habitat type in this category is Douglas-fir/rough fescue which covers about 42,000 acres.

Forage Production Losses and Potential to Regain. Impacts from long-term spotted knapweed infestation are discussed in Willard and others (1988). Based on those papers, it's assumed that long-term invasion of knapweed on Douglas-fir/rough fescue sites will reduce productivity from 1,049 pounds per acre to 124 pounds. It's assumed conversely that repeated treatment with either picloram or 2,4-D will improve productivity back to pre-invasion levels. This assumption may overestimate the effectiveness of control actions.

Winter Range and Spring Greenup Grass Dependence. According to the Lolo Forest Plan, elk are on the winter range from December 1 to May 15. The degree to which elk rely on grasses for winter survival, even within habitats dominated by bunchgrasses, is highly debatable. In heavy snow years, elk may forage almost exclusively on adjacent shrubfields and avoid bunchgrass that is covered by snow. Thus, a given loss in bunchgrass productivity due to weed invasion may not necessarily result in a parallel reduction in elk productivity.

On a broader scale, total winter forage is probably not the only factor limiting elk winter survival. Many biologists have suggested that the condition of animals entering the winter (a function of summer range productivity), and the availability of winter thermal cover, may be as important as winter forage in determining winter survival rates. This further exemplifies the fact that reductions in grass production do not necessarily result in parallel losses in elk winter survival.

At the first hint of "greenup" in early spring, even on winter ranges dominated by shrubs, elk use shifts to grasses. Spring (when elk fat reserves are lowest) is generally considered the most critical period to elk in terms of winter survival. Wet, cold weather during the spring and a delay in greenup may contribute more to winter mortality

than prolonged severe winter storms. Losses in grass production due to weed invasions may have the most impact on elk survival during this critical spring period.

While weeds have no effect on shrubs (Losensky 1987), they may reduce grass production, even on habitat types with low to moderate ecological risk to weed invasion. This could affect forage availability during the spring greenup period. Any such impacts should be limited to sites heavily disturbed by logging or grazing. For analysis purposes, this is assumed to be 25 percent of the acres in this category. According to Pfister and others (1977), palatable grasses occur at about 16 percent ground coverage on Douglas-fir/ninebark (pinegrass) sites, which is a common shrub-producing site on the Lolo, and 66 percent for rough fescue habitat types. Since an acre of rough fescue type produces about 1049 pounds of forage per year, a direct proportion would indicate that shrub sites may produce grass forage at about 254 pounds per acre. Assuming a 50 percent reduction in production due to overstory shading by shrubs, grass production might more realistically be estimated at 127 pounds per acre. Since knapweed and spurge are both shade intolerant, the percent loss from invasion will be much less than that documented in bunchgrass sites. For analysis purposes, it's assumed that 10 percent of the productivity (or 13 pounds per acre) will be lost by weed invasion on shrub winter ranges. This loss will only, however, be experienced during the spring (from March 15 to May 15).

Knapweed Utilization. According to Lavelle (1988), elk and mule deer pellets contain an average of 2-5 percent knapweed on bunchgrass winter ranges that are heavily infested with knapweed. Knapweed is high in protein so it's assumed that consumption of knapweed is beneficial to the animal. In winter, the only portion of the knapweed plant that elk eat is the flower or seed head. Consequently, the 5 percent knapweed probably represents a maximum that will show up in the diet as elk forage for other more palatable plants.

Surplus Winter Range Forage. For analysis purposes, it's assumed that elk are nearing carrying capacity for the forest as a whole, based on both vegetative factors and adjacent landowner tolerance. However, since wild ungulates are seldom well distributed, there are definitely areas where surplus forage exists. Moderate levels of weed invasion can probably be accommodated by elk simply moving to underutilized areas. In some cases, however, any further losses in forage production have a greater risk of reducing carrying capacity.

Weed Density. Another variable in estimating effects on elk is the density of weed infestations. For instance, the current situation describes 225,000 acres as infested with spotted knapweed. Lightly infested areas have probably as yet suffered no loss in grass productivity. Conversely, some of those acres have no doubt converted to a "knapweed monoculture" with near total loss in grass productivity. Also, some areas that are lightly infested now will probably have increases in weed density over time.

For analysis purposes, it's assumed that heavy infestations are confined to areas heavily roaded, logged, and/or grazed. Within the 48,000 acres of high risk winter range, these conditions are assumed to occur on 25 percent of the area. For the other 75 percent, it's assumed that total infestation will occur within 50 years and that the rate of infestation will increase as a straight-line curve. These assumptions may overestimate the future increase in weed infestation densities. Researchers are guardedly optimistic about the long-term potential for biological controls to slow the spread and reduce the density of knapweed and leafy spurge infestations.

Estimated Forage Production Loses. Using the above assumptions, the current big game forage production loss due to weed infestations is about 3 percent. Under no action, forage loss in 50 years may increase to 18 percent of potential. (See Appendix H for calculations). The estimated 3 percent loss in productivity is probably insignificant on a forest-wide basis. The reason for this is the questionable role that winter forage has on winter survival, the mobility of elk and their ability to use alternative winter ranges, the availability of at least some surplus forage in portions of the winter range, and the ability for big game to utilize knapweed. On a local level, however, particularly considering that some winter ranges are all in high risk habitat types, there may be some local losses in big game populations as a result of knapweed infestation.

The 50 year scenario, which gives a potential loss of 18 percent productivity, can be equated with a "worst-case scenario" for big game impacts. If deer and elk are at capacity on all winter ranges, and if winter forage totally

determines winter survival, and if no biological controls are effective over the 50 year period, this worst-case reduction in forage productivity could hypothetically reduce the forest's elk carrying capacity by over 2,250 animals. However, making the leap from changes in grass forage productivity to changes in population levels is highly speculative. Too many other factors control actual big game populations levels, making discussion of changes in animal numbers inappropriate.

Even though discussion of animal numbers is speculative and inappropriate given the current state of knowledge, some will still want to frame the discussion in those terms. An earlier attempt to estimate the impact of weeds on big game winter range (Spoon and others 1983) is still widely quoted, with quotes focusing on changes in elk numbers. The worst-case scenario presented above (carrying capacity reduction of 2,250 elk) is about ten times higher than the figure of 220 estimated by Spoon and others (1983). That figure, however, was based only on rangelands infected at that time and ignored lands vulnerable to weed invasion. Additionally, no loss was attributed to lands with low or moderate risk of weed invasion.

Because the actual impact of weeds on elk winter survivability and population numbers is unknown, the Lolo is pursuing cooperative research proposals with other agencies including the Bureau of Land Management, the University of Montana, the Montana Department of Fish, Wildlife, and Parks, and the Rocky Mountain Elk Foundation.

Actual impacts on elk winter range productivity will likely be in the lower end of the 3-18 percent range. Recognizing all the assumptions here that tend to overestimate weed impacts on big game, as well as the fact that many other factors affect population levels, it is more reasonable to talk about changes in forage production potential rather than animal numbers. Approximate worst-case per annum impacts on forage productivity can be calculated by plotting a straight-line curve from 3 percent loss at 1990 to 18 percent loss at 2040 (Figure IV-1).

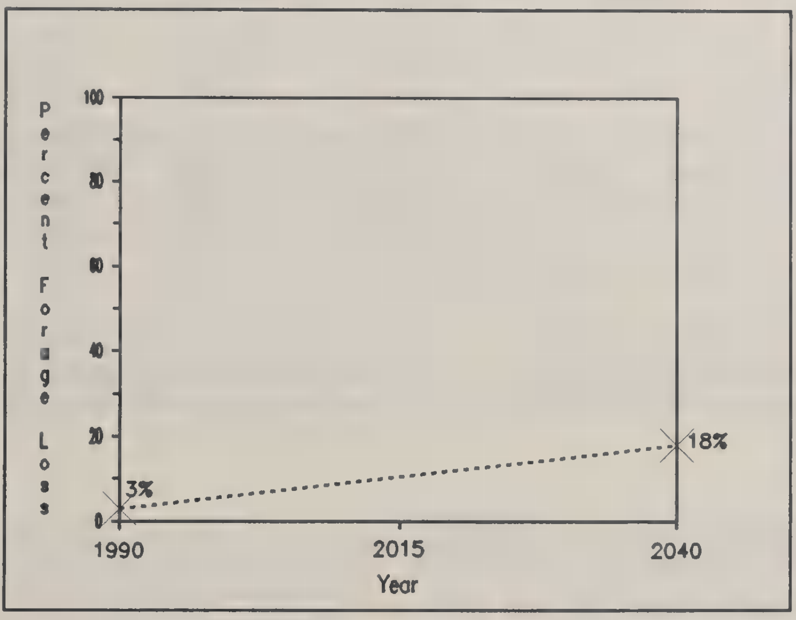


Figure IV-1. Worst-case Losses in Big Game Winter Range Forage Production

Nongame and Predators. Nongame species that may be affected by noxious weeds include: ■ seed eating animals such as pine siskins or voles which may be negatively impacted by losses of seed food sources; ■ open-ground-nesting birds such as nighthawks or horned larks, which may be negatively impacted by losses in ground cover; and ■ predators such as redtailed hawks or longtailed weasels which may be subsequently

impacted by a loss of prey species. No literature is available in this area, and it is possible that seed production and ground cover provided by weeds could offset some of these effects.

Native grass seeds and associated forbs such as arrowleaf balsamroot provide a critical food source for many small birds and mammals. Reductions in grass and forb stocking due to noxious weed invasion may be accompanied by a reduction in nongame populations in heavily infested areas. The mobility of such species may initially allow them to relocate to noninfested areas without severe reductions in populations. Long-term conversion of bunchgrass communities to a "weed monoculture" may eventually result in reductions in population densities of seed-eating animals. It has been suggested that knapweed and leafy spurge seeds are consumed by birds. This may offset the negative impact to some extent.

The impact on ground-nesting birds is difficult to determine. Knapweed, at moderate to high infestation levels, appears to provide better cover than native grasses, particularly when viewed from an angle. The visibility by a ground predator (such as a weasel) looking "through a knapweed stand" may be enhanced over native grasses due to the sparse structure of adult knapweed. Additionally, the sparse nature of knapweed heads probably makes ground-nesting birds more visible to avian predators. Therefore it appears likely that heavy infestations of noxious weeds may have a negative effect on ground-nesting birds. Ground-nesting birds that select overhead shrub cover for nesting (such as towhees) will probably be largely unaffected by weed invasions.

While weeds may increase the vulnerability of some prey species, long-term reductions in prey species could ultimately have a slight negative effect on predators. Fortunately, the mobility of such species and their ability to select alternate prey species makes it unlikely that weeds will have a significant impact on small mammal and avian predators.

Effects of Herbicides.

Eating contaminated food is the main way that animals could receive doses of herbicides, either through direct consumption of herbicide-treated vegetation (such as an elk eating grass immediately after herbicide application) or by indirect consumption (such as a coyote eating a rabbit that has consumed herbicide-treated grass). Other methods of exposure such as dermal absorption after walking through treated vegetation would result in insignificant dose levels, so they are not included in this analysis.

There is abundant research on the effects of herbicides on domestic animals. Unfortunately, there is little information on the effects of herbicides on wild animals. As a means of resolving this data gap, data on selected domestic animals was assumed to be representative for similar wild species. These species group relationships are illustrated in Table IV-2.

Table IV-2. Domestic Animals Representing Wild Species Groups

Domestic animals studied for herbicide toxicity	Comparable wild species group
mouse	all small wild rodents
dog	coyotes, red foxes, wolves
cat	lions, bobcats
pigeon	seed eating songbirds

Table IV-2. Domestic Animals Representing Wild Species Groups (continued)

Domestic animals studied for herbicide toxicity	Comparable wild species group
rabbit	varying hare, western cottontail
cow	all wild ungulates including elk, deer, sheep, goats, and moose

Acute Oral Toxicity. LD_{50}'s (lethal dose needed to kill 50 percent of the population) for given species are listed in Table IV-3 for three herbicides under consideration. Toxicity varies depending on the form of 2,4-D used, in this case "acid" or "butyl ester". As a means of showing a worst-case scenario, figures depicted represent the most toxic form. Smaller LD_{50} numbers indicate higher toxicity than the larger numbers.

Table IV-3. LD_{50}'s for Domestic Animals (mg/Kg)[1]

Species	Picloram	2,4-D	Glyphosate
mouse	2,000-4,000	368	na
(rat)	8,200	375	4,320
dog	na	100	na
cat	na	820	na
chicken	6,000	541	15,000 no effect
(mallard)	>2,000	na	>2,000
pigeon	na	668	na
rabbit	2,000	424	3,800
cow	540	100	na
(mule deer)	na	400-800	na

[1] The data in this table were taken from Sassman and others (1984) and the Southern Region Vegetation Management DEIS (USDA 1988: Appendix A, Section 6). The reader should consult those documents for thorough discussions of herbicide toxicity.

Since the lowest LD_{50} values are for 2,4-D, a worst-case toxicity risk assessment can be calculated for that herbicide, and risks from the other two chemicals can be assumed to be somewhat less. (See Appendix H for discussion of the general animal toxicity of these herbicides.)

Two species groups appear to be most sensitive to 2,4-D. This includes the dog (representing wild canids) with an LD_{50} of only 100 milligrams per kilogram of body weight, and the cow (representing wild ungulates) with an LD_{50} of 100. According to a study done by Hoerger and Kenaga (1972), an application rate of one pound per acre results in a herbicide concentration on range grass of 125 mg/Kg. Assume that at two pounds per acre application rates, the concentration would be 250 mg/Kg. Assume also that animals feed immediately after spraying and on nothing but sprayed vegetation. Then the worst-case dose calculations for cattle and elk can be made as follows:

Cattle. Assuming that a steer eats 75 pounds of green forage/day (35 Kg/day) and weighs 1000 lbs. (450 Kg), the dosage is 250 mg/Kg x 35 Kg/steer x steer/450Kg = 19 mg/Kg. This figure is only 19 percent of the LD_{50}, so 2,4-D at prescribed rates can thus be considered to be fairly non-toxic to cattle.

Elk. Assuming that an elk eats 36 pounds of green forage/day (16.4 Kg/day) and weighs 500 lbs. (230 Kg), the dosage is 250 mg/Kg x 16.4 Kg/elk x elk/230 Kg = 18 mg/Kg. This figure is only 18 percent of the LD_{50}, so assuming that elk have an LD_{50} comparable to cattle, 2,4-D at prescribed rates can be considered fairly non-toxic to elk.

Another concern with herbicide toxicity is long-term exposure. According to Monnig (1988), these three herbicides are excreted rather rapidly from tested animals, generally through the kidneys. Animals fed extremely high concentrations in laboratory conditions had either very low or undetectable concentrations in internal organs. Thus, it appears that warm blooded animals retain very little ingested herbicide.

Impacts on predators, represented by the dog, from secondary herbicide consumption can be calculated by the following process:

Predators. Based on Monnig's paper (1988), maximum muscle/organ concentrations of these herbicides is 0.1 mg/Kg. If a 50 lb. (23 Kg) coyote consumes 12 lbs. (5.5 Kg) of road-kill elk in a given day, the dosage is calculated as 0.1 mg/Kg x 5.5 Kg/coyote x coyote/23 Kg = .02 mg/Kg. This represents less than 1/400th of the LD_{50}.

According to the Sassman and others (1984), 2,4-D breaks down very rapidly and seldom persists longer than a month. When ingested, it is not soluble in fats or lipids. Based on these factors, it's impossible for a canine predator to accumulate enough 2,4-D to approach the LD_{50}.

Since 2,4-D exposure to dogs and cows represents the highest toxicity of the three chemicals considered, and since proposed application rates and several conservative assumptions give maximum dosage rates at less than 20 percent of the LD_{50}, it appears that wildlife and domestic animals would not be significantly affected by any of the alternatives.

A herbicide spill could result in concentrations hundreds of times greater than that occurring in treated areas. Potentially, if an animal were to feed exclusively within a spill area for an extended period of time, the LD_{50} could be exceeded. It's assumed, however, that spills of concentrated herbicide will be immediately treated as a toxic waste spill, that the area impacted will be small, and that animals will be largely excluded due to human activity in the area. Consequently, spills do not comprise a significant risk to wildlife populations. Additionally, the number of animals affected by such an event would be small due to the limited local nature of such events.

Effects of Physical and Biological Control.

None of these methods would significantly affect wildlife, particularly on a forest-wide basis. Anecdotal reports suggest that small mammals and birds eat some of the insects used for biological control of weeds. This could be a beneficial source of food for these animals.

Threatened, Endangered, and Sensitive Animals. A biological evaluation conducted in informal consultation with the U.S. Fish and Wildlife Service, concluded that none of the alternatives would affect threatened, endangered, or sensitive animals. See Appendix H for a copy of the biological evaluation.

Aquatic Habitat and Fisheries.

Effects of Weeds.

The effects of noxious weeds on the aquatic habitat and fisheries resources of the Lolo National Forest are minimal. Weeds are often the primary invaders into disturbed areas and can provide ground cover and stability which would reduce sedimentation into the streams. They also can provide bank stability and some degree of stream shading.

Effects of Herbicides.

Of the proposed noxious weed control measures, herbicide use poses the greatest potential risk to aquatic and fisheries resources. Impacts could occur from herbicides entering streams or lakes via aerial drift, runoff after storm events, or accidental spills. According to Norris and others (1983), contamination of the forest aquatic environment would be predominantly short-term acute rather than long-term chronic exposures. The degree of impact depends on several variables such as the chemical type, amount applied in a drainage, percentage of chemical reaching a stream, volume and flow rate of water, and life forms present in the stream. Spray operations can be designed to keep herbicide runoff and drift well below levels that could affect aquatic organisms. Accidental spills pose the highest risk to the aquatic environment, but the probability is low and mitigation measures are available to reduce both the probability and severity of a spill.

Below are brief summaries of toxicological hazards to aquatic organisms posed by picloram, 2,4-D, and glyphosate, including tables of fish toxicity. Invertebrate toxicity values are not shown in these tables because at least one of the fish values for each chemical indicates that fish are more sensitive than reported invertebrates. See Appendix H and USDA Forest Service Agriculture Handbook No. 633 Pesticide Background Statements Volume I. Herbicides (Sassman and others 1984) for more thorough discussion of aquatic organism toxicity.

Picloram. According to reviews by Kenaga (1969) and Sassman and others (1984), picloram is moderately to slightly toxic to aquatic species.

Table IV-4. Picloram toxicity in coldwater fish

Formulation	Organism	Exposure	Effects	Source
Picloram	Rainbow trout	Static 24-96 hour	LC_{50} = 24-34 ppm	USDI 1965 in Kenaga 1969
Technical Grade (90% a.i.)	Cutthroat trout	Static 96 hour	LC_{50} = 1.5 ppm	Mayer and Ellersiek 1986
Technical Grade (90% a.i.)	Cutthroat trout	Flow thru 22 day	NOEL to fry = 0.290 - 0.048ppm (author recommends stream residues not to exceed 290 ppb after 1st major rain)	Woodward 1979
Tordon 22K©	Brown trout	24-96 hour	LC_{50} = 52 ppm; NOEL = 22 ppm (96 hr)	Lynn 1965; Winston 1962 in Kenaga 1969
Tordon 22K©	Rainbow trout	24-96 hour	LC_{50} = 50-58 ppm; NOEL = 22 ppm (96 hr)	Lynn 1965; Winston 1962 in Kenaga 1969
Tordon 22K©	Rainbow trout	Flow thru 10 day	LC_{50} = 22.2 ppm	Fogels and Sprague 1977

NOEL = No Observed Effect Level.

2,4-D. Toxicity to fish and invertebrates ranges from highly toxic to slightly toxic. Differences are due to animal sensitivities and herbicide formulation. In most cases, fish LC_{50}'s (the lethal concentration in water required to kill 50 percent of a test population) were reported to be greater than 1.0 ppm, and in a number of cases greater than 10.0 ppm. In general, fry and fingerlings are more sensitive than eggs for rainbow trout.

Table IV-5. 2,4-D toxicity in coldwater fish

Formulation	Organism	Exposure	Effects	Source
acid, granular (100%)	Cutthroat trout (0.3 gram fish)	Static 96 hour	LC_{50} = 64 ppm	Johnson and Finley 1980
acid	Rainbow trout (fingerlings)	Static 96 hour	no mortality at concentrations up to 50 ppm	Meehan and others 1974
potassium salt	Rainbow trout	Continuous flow thru from fertilization to 4 days post hatch	LC_{50} = 11.0 ppm (soft water) and 4.2 ppm (hard water)	Birge and others 1979
potassium salt	Rainbow trout	---	NOEL = 0.13 ppm (soft water) and 0.18 ppm (hard water)	Birge 1989[1]
butyl ester (liquid 98.4%)	Cutthroat trout (0.8 gram fish)	Static 96 hour	LC_{50} = 0.9 ppm	Johnson and Finley 1980
butyl ester (98.4% ester, 78.5% a.e.)	Cutthroat trout (fingerlings, 0.4-0.8 grams)	96 hour	LC_{50} = 0.78 ppm	Woodward 1982

NOEL = No Observed Effect Level.
[1]Personal communication: Dr. Wesley Birge, Dept. of Toxicology, Univ. of Kentucky, Lexington.

Glyphosate. Glyphosate in the Rodeo® formulation is generally nontoxic to a variety of invertebrate organisms. Other formulations include surfactants that are more toxic to aquatic organisms than glyphosate alone. That is why Rodeo© does not include a surfactant, and is labelled for use in aquatic environments. A number of studies have shown that most fish are extremely tolerant to glyphosate. Glyphosate is strongly adsorbed to soil particles, has a low tendency to runoff, and is relatively nonleaching.

Table IV-6. Glyphosate toxicity in coldwater fish

Formulation	Organism	Exposure	Effects	Source
Rodeo©	Trout	96 hour	LC_{50} > 1,000 ppm	Monsanto 1982
Rodeo©	Trout	96 hour	LC_{50} > 680-1,070 ppm	Mitchell and others in USDA 1988

Operational Exposure and Risk. A review of the literature indicates that very little chemical enters the aquatic system during ground spraying operations if label precautions are followed. Sassman and others (1984) estimate that every pound per acre of active ingredient applied could result in an in-stream concentration of 0.01 parts per million (ppm). This estimated concentration is higher than that of 99 percent of sampled streams following actual upstream phenoxy herbicide application (Neisess 1983). The literature, however, does indicate that concentrations of chemicals can increase in streams following the first significant rainfall after application.

While some studies have not been able to show that any detectable levels of picloram reach a stream following treatment, others have found as much as three percent of the total amount of chemical applied does reach the stream, and as much as 90 percent of that amount arrives during the first rainfall following application.

Appendix D includes a mitigation measure designed to prevent exposure levels that could exceed NOELs for the most sensitive aquatic species. This mitigation requirement would be applied to all herbicide projects within 500 feet of a fishable waterway. Within that zone, a back-calculation would be made – using the NOEL, water flow, and portion of herbicide application that could be carried into the water by a storm event – to derive a maximum allowable amount of herbicide that could be applied in the drainage. See Appendix D for details.

Accidental Spill Exposure and Risk. As discussed in the section on Human Health and Safety, the probability of a herbicide spill into surface water is very low. However, the possibility cannot be discounted entirely.

Because many forest roads are adjacent to streams, a possible scenario involves the spill of a tank of herbicide directly into a stream. The amount of herbicide discharged under such circumstances could vary significantly. For example, a pickup truck carrying a 200 gallon tank mix to be applied at the rate of 50 gallons of water and ¼ pound of picloram per acre would be carrying a total of one pound of herbicide active ingredient. The same truck carrying 2,4-D to be applied at two pounds per acre would be carrying a total of eight pounds of active ingredient. Generally speaking, spray trucks would be carrying less than five to ten pounds of active ingredient.

Aquatic concentrations following a major breach in a tank and a direct spill into a stream would also depend on stream characteristics such as flow rate and turbulence. Models have been developed to predict such concentrations (see, for example, Krenkel and Novotny 1980). However, these models generally require the specification of many parameters and coefficients that make them impractical to solve and their predictive validity marginal.

Although the scientific literature on actual spills is limited, two experimental studies with picloram do give some indication of the range of impacts. Mayeux and others (1984) directly poured about 2.8 pounds of picloram active ingredient into a stream flowing at 190 cubic feet per second (cfs). At 100 yards from the introduction point, a maximum concentration of 14 parts per million (ppm) was observed about six minutes after introduction. Maximum concentrations fell off quickly with distance from the injection point; at about 3.5 miles the maximum concentration was 0.005 ppm.

Although the mixing characteristics of that Texas stream would differ from those of many streams in this area, a similar dissipation pattern was observed in a Arizona mountain stream. Johnson and Warskow (1980) metered picloram into a stream for 50 minutes at a concentration of 6.26 ppm. No picloram was detected beyond about four miles (at a detection limit of 0.001 ppm). Detection stations closer than four miles recorded a "pulse" of picloram (maximum concentration was 2.362 ppm at ¼ mile downstream) that lasted about an hour, nearly the same period as the slow metering at the introduction point.

These two studies suggest two generalizations about herbicide spills into streams: 1) concentrations tend to drop rapidly within a short distance of the spill site, and 2) at any given point in the stream, the elapsed time of exposure should be short.

The spill of larger amounts of herbicide into smaller streams could result in initial concentrations that are higher than those observed in the study by Mayeux and others (1984). The LC_{50} values for trout could be exceeded, but these values are based on continuous exposures for 96 hours. By comparison, exposures due to spills would be on the order of minutes to a few hours. These exposures might be sufficient to kill fish or affect survival behaviors of aquatic organisms, particularly those in sensitive life stages. Rapid dissipation and short exposure duration suggest that fish kills would not be extensive under most accident scenarios, but information needed for a quantified estimate is incomplete.

Appendix D includes mitigation measures designed to minimize the already low probability of an accident resulting in a spill into a stream. For instance, only the amount of herbicide needed for one day's work would be transported at any given time. Mixing would only be done at sites where spills into streams could not occur.

Effects of Physical Control.

The proposed manual and mechanical control of weeds would not significantly impact fisheries resources. As stated in Chapter II, the methods of physical control that would be employed are grubbing/pulling by hand, and mowing/topping plants primarily with hand tools. Neither of these methods would be used on a large scale, therefore little if any deleterious impacts are anticipated.

Effects of Biological Control.

The use of the proposed biological control agents (weevil, beetle, and goats) to contain or suppress noxious weeds would not impact the aquatic resources if proper management guidelines are followed. Grazing impacts (such as increased erosion, sedimentation, decreased bank stability, etc.) from the use of goats in riparian ecosystems and streams can be minimized if the duration of the grazing and the number of animals is kept to a minimum required time and number.

Threatened, Endangered, and Sensitive Fish. Potential impacts on sensitive fish are no different than those discussed in above. Mitigation procedures discussed in Chapter II and listed in Appendix D are designed to ensure that the two sensitive species are protected when vegetative treatments are employed. In addition, Forest Service policies for management and protection of watersheds (FSM 2521), riparian areas (FSM 2526), and fish habitat (FSM 2630) are implemented through prescriptions and Best Management Practices to minimize adverse impacts on fish and fish habitat.

Range.

Effects of Weeds.

Most of the noxious weeds that occur on the Lolo National Forest are dependent to some degree on soil disturbance, vegetation removal, or canopy opening for their establishment. Literature and observation show a correlation between moderate to heavy livestock grazing and existing noxious weed infestations. Livestock can help distribute seed, and even with proper stocking levels can cause localized soil disturbance conducive to weed establishment and subsequent seed supply. Moderate to heavy grazing further compounds the problem by the removal of competing vegetation. Light grazing, on the other hand, can contribute to the vigor of range plants by providing a "pruning" effect and preventing accumulation of old, decadent growth, while at the same time providing a benefit to local economies. This stimulation and improved vigor may make native plants more competitive with weeds.

Although discontinuation of all grazing would not make the weeds go away, past moderate and heavy grazing has, in some cases, contributed to current infestations.

Shading plays a more important role in forestland grazing than in traditional open, non-shaded ranges. With closure of the overstory canopy, removal of continued disturbance, and reduced grazing pressure on competing native vegetation, some weed species will decline or continue in a mostly vegetative stage with low reproductive capacity.

Many of the cattle that graze on the Lolo National Forest accept or tolerate some weeds. The tolerance results in utilization of some weeds on forest ranges. This utilization of weeds (particularly spotted knapweed) may offset some of the impacts of noxious weeds in relation to carrying capacity.

The actual current impacts from noxious weeds are determined only from actively grazed allotments where there is an observed reduction in grazing capacity. No impact is considered on inactive allotments where grazing is not recommended due to other resource conflicts, even if weeds occur in those allotments. Nor is an impact considered on active allotments where weeds are established but are utilized by livestock. Some allotments are stocked below maximum livestock capacity in consideration of other resource values. No impact is considered if permitted capacity is available, even though maximum potential capacity may be reduced, but exceeds permitted use.

Spotted knapweed. This weed affects the greatest range acreage of any weed on the forest, and is considered a major problem on Lolo rangelands. It occurs on pastures, roadsides, and areas exposed to heavy grazing pressure. Populations on well managed, lightly grazed rangelands do not increase rapidly. Weed seed and contaminated feed are sources of off-road spread. Shade prevents establishment and large-scale spread of this weed.

The worst infestations are found on southwest aspects, and along north-south roads with no tall vegetation. Gravelly textured soils are high risk. Most threatened rangelands include ponderosa pine and/or Douglas-fir/bunchgrass habitat types, and dry shrub communities like Douglas-fir/snowberry or Douglas-fir/ninebark-pinegrass. Continued moderate to heavy grazing and activities that maintain open canopies prevent normal succession and can maintain heavy knapweed infestations indefinitely.

Spotted knapweed has currently reduced grazing capacity by about 1,040 Animal Unit Months (AUM – The quantity of forage required to feed the equivalent of one mature, 1,000-pound cow for one month) forest-wide. This weed could cause an additional 900 AUM reduction in forest-wide grazing capacity over the next ten years if no additional control action is undertaken.

Diffuse knapweed. This weed occurs on quite limited acreages on Lolo rangelands and therefore its impact is proportionately reduced. Where present, it has forage reduction impacts similar to spotted knapweed. Ponderosa pine and dry Douglas-fir/bunchgrass rangelands are at risk.

Diffuse knapweed has currently reduced grazing capacity by about 15 AUMs forest-wide. This weed could cause an additional 30 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Canada thistle. This weed is best suited to riparian rangelands on the Lolo, although it is not considered a serious threat to National Forest land. It requires a moist environment and has a strong association with cattle-grazing, but does not do well in very wet, poorly aerated soils. It is a poor competitor however, and usually degenerates behind an advancing front and dies out in the center of an infestation. It may decline in about five years without continued disturbance.

Canada thistle has currently reduced grazing capacity by about 50 AUMs forest-wide. This weed could cause an additional 50 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Musk thistle. This weed is a very low threat to Lolo rangelands and has a very limited impact on management. It is difficult to establish without grazing or some other disturbance, and is most abundant on moderately to heavily grazed pastures. It does not do well on dry rangelands.

Musk thistle has currently reduced grazing capacity by about 30 AUMs forest-wide. This weed could cause an additional 35 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Goatweed. This weed is a major threat to open grass communities and is a problem on drier, heavily grazed sites. Once established on open sites, it can survive in spite of native competition and no further disturbance. Infestations are spotty in forested (closed canopy) environments. It can out-compete knapweed in grass communities, but is not as competitive in the forest environment. Large patches are usually less that 100 stems. It is usually associated with logging, grazing, fire, and roads. It is best distributed by the hair on animals (especially sheep).

Goatweed has currently reduced grazing capacity by about 35 AUMs forest-wide. This weed could cause an additional 95 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Houndstongue. The impact of this weed on forage availability is limited. Typical environments are open spots in brush and disturbed road sides. It is commonly found with moderate to heavy grazing and is spread mostly by horse and cattle hair (the seed adheres poorly to fine-furred animals like rabbits, deer, and elk). It does not maintain a seed bank and active grazing is critical for maintenance of the weed in most communities.

Houndstongue has currently reduced grazing capacity by about 55 AUMs forest-wide. This weed could cause an additional 80 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Leafy spurge. This weed poses one of the most serious future threats to forest rangelands due to its persistence and ability to survive in dense shade. It has limited presence in forested communities to date. Current Lolo stands occur on both disturbed and undisturbed Douglas-fir/Idaho fescue sites, and grass communities in the Douglas-fir/ninebark habitat type. Its extensive and persistent roots make it very difficult to kill once established. It does not flower under a dense tree/shrub cover, but it is unclear if vegetative spread can gain adequate density in the forested environment to impact native vegetation. Present infestations on the Lolo occur at lower elevations.

Leafy spurge has currently reduced grazing capacity by about 45 AUMs forest-wide. This weed could cause an additional 210 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Tansy. This weed is generally a low risk to management, but a moderate risk to grazing lands on the Lolo due to the weed's riparian preference. It's greatest risk along on road shoulders, and minor and major stream riparian zones streams (particularly those with moderate to heavy grazing), where dense stands may reduce other vegetation. No livestock use has been observed on riparian infestations.

Tansy has currently reduced grazing capacity by about 15 AUMs forest-wide. This weed could cause an additional 35 AUM reduction in grazing capacity over the next ten years if no additional control action is undertaken.

Dalmatian toadflax. This weed is considered a low risk to forest communities. It is usually found on rangeland and has limited occurrence within the forest zone. Its distribution is limited, confined primarily to private land in the major valleys. It is difficult to control once established.

Dalmatian toadflax has currently reduced grazing capacity by about five AUMs forest-wide. This weed could cause an additional 20 AUM reduction in grazing capacity over the next 10 years if no additional control action is undertaken.

Summary. The above estimates of current and future impacts from noxious weeds are approximations that are rounded for the sake of discussion. A total of 1,290 AUMs may currently be lost annually due to the presence of noxious weeds on Lolo National Forest rangelands. In other words, the forest-wide range capacity without any noxious weeds could be 10,890. This represents a 12 percent decrease in current range capacity due to the current presence of noxious weeds (1,290 ÷ 10,890 x 100% = 12%). An additional 1,450 AUMs may be lost forest-wide over the next ten years if no additional control action is taken. This would result in a 25 percent reduction in potential (weed free) range carrying capacity ((1,290 + 1,450) ÷ 10,890 x 100% = 25%), or a decrease from the current 9,600 AUMs to approximately 8,150 AUMs (Figure IV-2).

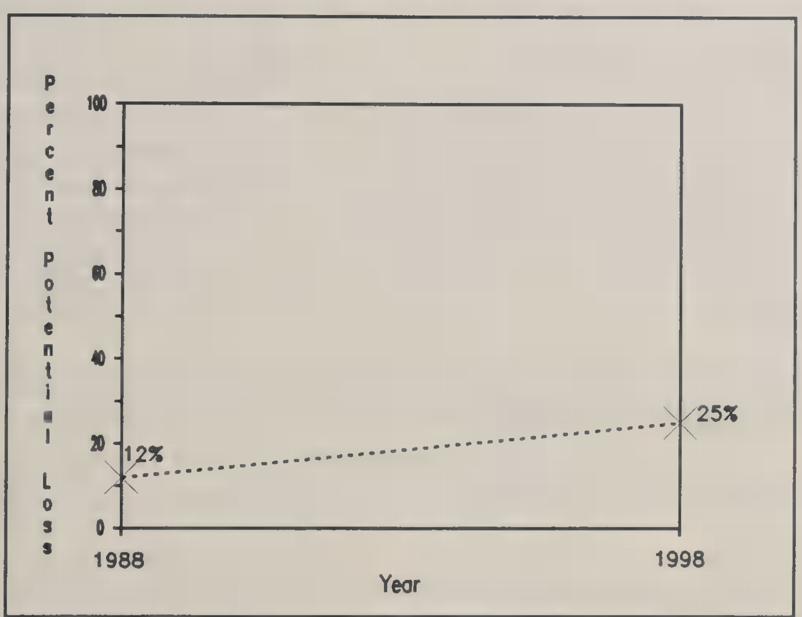


Figure IV-2. Estimated Worst-Case Losses in Livestock Range Capacity due to Noxious Weeds

Effects of Control Measures.

The following effects analysis is based on the assumptions given in the next two paragraphs:

> Active range allotments on the Lolo National Forest include approximately 67,600 acres of suitable National Forest range. This represents about three percent of the total National Forest System acreage managed by the Lolo National Forest. Much of this acreage lies on open gentle slopes and in riparian sites, both of which are generally moderate to high risk for the establishment of noxious weeds. Some degree of noxious weed infestation occurs on all range allotments.
>
> Any and all herbicides would be applied in strict compliance with label recommendations. All label recommendations pertaining to livestock grazing would be followed in regards to holding animals off treated areas after treatment. Permittees would be advised of label recommendation pertaining to dairy animals, use of manure from animals grazing treated areas, and animals to be finished for slaughter.

Herbicide toxicity to cattle is discussed above in the wildlife section, and in Appendix H. Given the proposed chemicals, application rates, and mitigation measures (including adherence to all label requirements), none of the alternatives pose a toxic risk to cattle.

Spotted knapweed and leafy spurge account for approximately 77 percent of the AUM decreases (under the no action alternative) from 1988 to 1998. Due to current infestation levels, these are also the species for which large scale control measures have the least likelihood of success. The greatest likelihood for successful control is for the species that currently occur on National Forest at the lower infestation levels. Due to such low current infestation levels, these species also have the least impact on current AUM output. In light of the relatively small range program on the Lolo National Forest (measured as total AUM output) and the fact that all proposed alternatives except E provide for some degree of spread of spotted knapweed and leafy spurge, the differences between AUM outputs for Alternatives B, C, and D are relatively small.

Although some of the described weed control methods could affect the presence and abundance of desirable native or exotic vegetation, the reviewer should not conclude that any or all such resultant palatable vegetation would automatically be allocated to livestock. In most cases, the primary range forage objective would be to maintain current production levels. Due to the magnitude and distribution of existing weeds on the Lolo, significant increases in either allocatable or unallocatable forage is unlikely. Any such changes in vegetation composition would be individually evaluated in relation to the standards and goals for each particular Management Area as described in the Lolo Forest Plan. In some cases, such forage may be allocated to non-livestock outputs (as identified in the Forest Plan). In all cases, the role of livestock in the initial establishment of the weed will be evaluated in order to preclude future livestock grazing intensity to the extent that such activity may have facilitated the original establishment of any given weed. For these reasons, weed control does not result in increased AUM projections at the end of the decade, even under Alternative E.

It is not possible at this point to assess the impact (benefits) on range that may be realized from preventing the establishment of weeds (i.e. new invaders) that do not currently occupy National Forest System lands.

Timber.

Effects of Weeds.

The Forest Plan projected average annual timber harvest activities on about 15,700 acres, but much of this activities is on habitat types that are at low or no ecological risk to weeds. This activity can disturb ground and reduce shade, providing sites for weed establishment and spread. The equipment used in timber harvest activities can also spread weeds. Several mitigation measures are listed in Appendix D that should reduce the spread of weeds due to timber activities.

Currently, their are no known detectable effects of the identified noxious weeds on the timber resource. The projected 10-year increase in noxious weeds will also not have an effect on the land's capability to regenerate and grow trees. Losensky's (1987) summary on the management implications from the impacts of weeds on forest communities indicates essentially no known effects to the timber resource.

The potential for moisture competition may have the most effect. Reasons that weeds are able to replace other plants may be that they're more efficient in obtaining moisture and nutrients on marginal sites. Weeds then might be a greater competitor to establishing seedlings than native vegetation if in fact native vegetation is replaced. Some research has suggested that spotted knapweed may be allelopathic (poisonous to other plants), but these effects are very slight, if they exist. Williard and others (1988) found only a slight allelopathic effect from spotted knapweed on conifers. Moisture and nutrient competition probably are more important factors than allelopathy. This is very speculative, though, and current knowledge does not indicate that noxious weed competition is a problem for conifer establishment or growth on the Lolo National Forest.

The habitat types that would be potentially more critical are the dry types of the Douglas-fir and ponderosa pine series. We harvest few acres of these types as a total part of our timber management program.

Effects of Herbicides.

There are a few studies that have demonstrated tree growth response to vegetation removal from herbicide applications. Boyd (1985a) determined "although weed control can substantially benefit conifer survival and growth, control does not guarantee improved tree performance." Climatic factors can affect treatments more than any other factor. Weeds in Boyd's studies were not noxious weeds but rather common vegetation, mainly native plants. Another report of Boyd's (1985b) suggests that herbicide treatments may produce counterproductive side effects such as root disease increase from killed vegetation and increased tree mortality from rodents due to removal of their food supplies. Boyd's (1985a) conclusion is that the removal of competing vegetation ameliorates internal seedling stress.

Work by Robert Wagner and Terry Peterson of Oregon State University (presentation at the Inland Empire Vegetation Management Working Group – unpublished 1989) suggests that growth and survival of seedlings with regard to competition removal must be considered separately. Their work demonstrated that the two respond quite differently. Survival response is reached quite rapidly with slight reductions in vegetation competition, but positive growth response takes a lot of vegetation control before substantial results are achieved.

The three chemicals proposed for use can have detrimental effects on conifers. Boyd and others (1985) have a good list of seasonal effects by species and chemical. The conifer species found on the Lolo can be sensitive to these herbicides, especially during the early foliar season, though effects vary considerably by *application rate, method, carrier, and herbicide*. Sensitivity includes out right mortality, top kill, bud kill, and defoliation.

For example, one of the more abundant noxious weeds, spotted knapweed, is found on sites commonly occupied by ponderosa pine and Douglas-fir. Late summer and fall applications of 2,4-D have the least impact on ponderosa pine. Early foliar applications may have the least impact on Douglas-fir depending on application rate and carrier.

The residual nature of picloram would also require a delay in establishing desirable vegetation on some sites. Boyd and others (1985) recommend waiting up to eight months before planting conifers on picloram treated sites. The label for Tordon 101© (a picloram formulation labeled for use on weeds and brush in right-of-way and forest planting applications) recommends waiting up to 12 months.

Mitigation measures should include an analysis of non-target species to determine timing of application to meet the objectives of noxious weed control along with acceptable impacts to the non-target species. In some cases tree protection may be called for to insure established trees remain after the treatment. In other cases, the elimination of conifers may be a management objective. Data on the effects to conifers and other species is available (Boyd and others 1985) and could guide the treatments to meet objectives.

Effects of Physical and Biological Control.

These methods would have no significant effect on timber resources.

Water and Soils.

The water and soil impacts of all alternatives would be insignificant when compared to other ongoing activities on the forest. For instance, the activity of one timber sale will produce more erosion than would any of these alternatives. With that in mind, the possible effects on water and soil are discussed below.

Effects of Weeds.

Weeds fill an important ecological place in the development oriented human environment. When lands are disturbed or over-utilized, weeds become primary invaders for several reasons. Disturbance and removal of vegetation increases erosion rates, and reduces natural fertility and water-holding capacity. Under these droughty, less fertile conditions, invaders (native and weed species) can often out-compete the native members of the natural, undisturbed community.

From a watershed viewpoint, weeds play an important role in revegetating severely disturbed lands where no rehabilitation is performed. Most weeds are fast colonizers, able to extract water and nutrients in droughty, less fertile sites. Because weeds will readily revegetate disturbed areas, they provide ground cover and reduce erosion much more quickly than would native species.

Research has suggested that sediment and water yields are higher on sites covered with knapweed than on sites with mixed grass cover. It is important to note that these increases would not be significant when compared to the amount of sediment and water yield increase that would come from bare ground. It is also very important to understand that, on a watershed-wide basis, there are so many variables affecting sediment production and water yield, that any increases due to weeds would generally be undetectable.

Effects of Herbicides.

Potential effects of the three proposed herbicides on soil and water are discussed in Appendix H. That analysis concludes the following:

■ Current herbicide application technology exists to minimize herbicide residue movement into sensitive surface waters. Short-duration residue concentrations of 0.5 to 1.0 ppm might occur during stormflow. On-site degradation processes and in-stream dilution and degradation result in quick dissipation of herbicide residues. Short-term water quality effects are minimal, and long-term water quality is not adversely affected. Long-term water quality can be improved by herbicide use since stream sedimentation is reduced.

■ There is no documentation or indication of adverse biological effects on soil productivity from use of the chemicals examined in this environmental impact statement.

■ At currently registered herbicide application rates, some short duration, low level (less than 0.024 ppm) pulses of herbicide residues could enter unconfined surface aquifers. Rates proposed in this EIS are well below the maximum rates given on the herbicide labels. Detectable residues would not persist for a long time and would not be likely to exceed water quality standards. Contamination of regional ground water aquifers is not likely.

■ The greatest hazards to surface and ground water quality arise from a possible accident or mishandling of concentrates during transportation, storage, mixing and loading, equipment cleaning, and container disposal phases of the herbicide use cycle.

The potential impacts of an accident are discussed in the sections on Human Health and Safety, Wildlife, and Aquatic Habitat and Fisheries.

Effects of Physical Control.

Physical treatment of weeds has a moderate potential for damage to the watershed resource depending on the equipment and method used. Those processes that require some kind of ground disturbance (hoeing or digging) have much higher potential for erosion and sediment delivery than individual pulling or cutting procedures. Areas of physical treatment have the added disadvantage of needing some kind seeding to fill the treatment area or weeds will reestablish themselves.

Effects of Biological Control.

Biological treatment of weeds for the most part is the least damaging system to the soil and water resource, except for grazing. These methods typically provide for the slow removal of targeted plants while adjacent non-target plants naturally fill in.

Grazing has proven to be a viable option where animals can be forced to concentrate on targeted weeds by herding or some other restrictive method. Potentially, grazing has the disadvantages of trampling non-target plants, compaction of the area, breaking down stream banks, and, without careful monitoring, changing the vegetation types. These things can lead to poor channel stability, increased water flows and increased sediment delivery. Proper management can avoid these impacts.

Minerals.

Ground disturbance associated with minerals activities can create seedbeds for noxious weeds. All alternatives propose mitigation measures to limit this effect (see Appendix D), and many of these measures are already required for other resource protection purposes. None of the weeds, control measures, or mitigation measures will significantly affect minerals activities.

Lands.

Special use permits often include activities or sites (ditches and dams, residences, communication sites, utility transmission corridors, ski areas, resorts, etc.) that disturb soil and remove and prevent shading from tree or shrub canopies. These activities can create conditions that favor weed establishment. Once infested with weeds, these sites can contribute to weed spread to other sites. While the listed noxious weeds generally have little effect on the primary purposes of the special use permits, weeds or weed control on these sites can affect other resource values on those sites as discussed in other sections of this chapter.

Mitigation measures listed in Appendix D can be included in the terms of special use permits to help prevent weed spread or to reduce weed impacts on other resources.

Land Exchange and Real Estate.

Effects of Weeds.

There is no known source of direct market evidence to evaluate the effect of weeds on land value. The following conclusions are based on professional judgment and experience in land valuation.

Land is acquired for a number of different purposes. The appraiser must decide which use – among all the potential uses that are legally permissible, physically possible, and socially acceptable – would generate the highest return. This use is commonly called the highest and best use. Noxious weeds would affect the value of land to the extent that the weeds interfere with the highest and best use.

The most rural lands within the Lolo National Forest are valuable for one of the following highest and best uses: Rural Residential, Recreational, Agricultural, and Timberland. The presence of noxious weeds would not affect residential or timberland uses. Recreation land, while typically not acquired for its vegetative cover, is sometimes used for grazing and may show some value loss because of weeds. It may be argued that weeds are less scenic as compared to native grasses, but the typical buyer probably could not tell the difference. There would few cases where a recreation land buyer would price discriminate because of weeds.

Agricultural land is the only use where noxious weeds are likely to affect market value to any measurable extent. There is very little land within or adjacent to the Lolo for which agriculture is the highest and best use. There is land being used for agriculture, but agricultural production value is generally secondary to such value factors as subdivision potential, seclusion, location, and investment value. Ranching property in Western Montana typically sells at values substantially beyond those that can be amortized from agricultural income. In theory, the value of agricultural property could be damaged to the full cost to cure the weed problem, provided it is economically justifiable.

Effects of Herbicides.

Little information is available on the effects of herbicides on land values. One anecdotal report tells of a prospective buyer of a ranch in Montana who backed out of a purchase after discovering that picloram had been applied to the property (Barbara Mullin, 1989 Leafy Spurge Symposium, personal communication). On the other hand, in most cases, weed control could increase land value.

Effects of Physical and Biological Control.

Neither method should affect land values. Weed control could increase land value.

Roads.

Ground disturbance associated with road construction, maintenance, and use create seedbeds for noxious weed establishment, and can contribute to the spread of weeds by vehicles and equipment. Past road construction and maintenance practices were not sensitive to weeds, and often contributed unnecessarily to their spread. All alternatives propose mitigation measures to limit these effects (see Appendix D), and many of these measures are already required for other resource protection purposes. None of the weeds, control measures, or mitigation measures will significantly affect the road program.

Fire.

Weeds have complicated responses to fire. Fire can reduce weed coverage or can contribute to weed spread, depending on a wide variety of factors including weed species, time of year, intensity of burn, habitat type, pre-existing vegetation, fire control methods, and rehabilitation activities. The last, rehabilitation, can have the most far reaching impacts on weeds. Quick, effective revegetation of a burn, whether natural or through artificial seeding and planting, can assure that desired plants re-occupy the site before weeds can move in. On the other hand, revegetation seed mixes that contain weed seeds can quickly spread weeds into new areas.

Air Quality.

Air quality would not be significantly affected by any of the alternatives. For those alternatives that include herbicides, short-term minor effects would be limited to the odor given off by these chemicals in the immediate vicinity of a spray site. This odor would disappear within a few hours or days.

SUMMARY OF IMPACTS BY ALTERNATIVE.

Each alternative is summarized below by issue or resource. The alternatives are compared in Chapter II. The effects summarized below are upper-bound estimates assuming full funding and implementation of each alternative. Actual effects would be at or below the levels discussed.

Alternative A.

The No Action Alternative relies on very limited use of mechanical and biological controls to slow weed spread. It emphasizes prevention and proposes virtually no direct control action. No chemical use is proposed.

Human Health and Safety. There would be no significant effect under this alternative.

Vegetation. Expansion of areas infested by noxious weeds would continue at about present rates. Short term results may be development of monocultures of spotted knapweed, goatweed or leafy spurge on heavily infested sites. Continued pressure will occur on sensitive plants in some locations. Long term results of biological control may eventually reduce the density of some weed species. However infestation of all suitable sites for a particular weed will probably occur. Ecological diversity will eventually stabilize at some point in the future, with noxious weeds maintaining a presence at the expense of native plants.

Recreation. In developed sites weeds will continue to invade campgrounds, picnic areas and beaches, degrading the sites and the recreation experience. Noxious weeds will continue to degrade the dispersed recreation experience across the forest and in Wilderness because of loss of aesthetic values and vegetative variety.

Cultural Resources. Some historic sites would continue to have the visual aspect of their historical integrity compromised.

Visual Quality. Landscapes would continue to be affected, with impacts increasing from existing species as they spread their ranges to biological limits. Proposed control measures would have negligible effects on visual quality.

Wildlife. Extrapolating from the curve developed for Figure IV-1, ten more years of no weed control could result in a 6.5 percent reduction in big game winter range forage production potential. This compares to an estimated current loss of three percent of potential. This worst-case projection could climb to an 18 percent loss of potential in 50 years. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Alternative A has the lowest risk to the fisheries and aquatic resources since no weed control activities are proposed and these weeds do not negatively impact these resources. Fish populations and habitats would remain essentially unchanged. Normal preventive measures are not expected to impact the aquatic resources to any measurable extent, except where these measures reduce sediment and improve habitat conditions.

Range. This could result in a decrease of around 1,450 AUMs by 1998. This represents an approximately 15 percent reduction in carrying capacity when compared to 1988 AUM levels (9,600 AUMs) or about 25 percent less than the potential without weeds (Figure IV-2).

Timber. There would be no significant effects on timber resources or activities.

Water and Soils. This alternative would eliminate the risk of any chemical contamination due to weed control activities. It would allow weed infestations to advance basically unchecked. This would allow a slight increase in sediment production and water yield increase in those areas where weeds are the major component of the plant community. Areas where this is a concern would be the drier habitats on the forest. These areas already have higher sediment and water yield delivery so continued and increasing infestations would enlarge to situation. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative B.

Direct weed control action would be limited to areas where adjacent landowners have active weed control programs and request cooperation from the Lolo. Table IV-7 shows the upper-bound estimates for treatments under Alternative B (if fully funded and implemented).

TABLE IV-7. Treatment Acres — Alternative B

Method	Decade Total	Average Annual
Physical	0	0
Biological	1	0
Chemical	1,920	810

NOTE: Average annual is more than 1/10th of the decade total because the same site may have to be treated several times during decade for some methods. See Tables II-2, II-3, and II-6 for repeat application frequencies.

Human Health and Safety. Risks to human health and safety would be very slight, given the small amount of herbicide application proposed. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. Only minor differences would be noted in the effect on vegetation between Alternatives A and B. Treatment of about 1,900 acres by chemicals during the decade would have an adverse impact on some forbs and shrubs, and could result in their elimination from some communities. A minor increase in the ecological integrity of the forest could be expected by reducing the rate of increase in some weeds. Sensitive plants could be adversely affected if spraying occurs where they are established. This loss could be expected to be higher from spraying than from normal expansion of noxious weed as experienced in Alternative A.

Recreation. Same as Alternative A.

Cultural Resources. Same as Alternative A.

Visual Quality. Same as Alternative A, but with a slight reduction in weed spread.

Wildlife. Assuming that the limited control measures would reduce some weed spread on both national forest winter range, and on adjacent non-Forest Service lands, this alternative might result in a loss of winter range forage production potential of six percent after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Possible impacts to the aquatic resources would be greater than in A, but to a relative degree. Impacts could come from herbicide spills or grazing in riparian ecosystems, but should be minimal to nonexistent if proper safeguards and listed mitigation techniques are employed.

Range. Under this alternative, chemical control would be the most active control measure taken, but only in co-op areas where adjacent landowners are actively controlling weeds on their land. This alternative would not concentrate treatments in areas currently within active livestock allotments. The emphasis on co-op areas would only provide treatment on suitable areas in livestock allotments where they occurred adjacent to other ownerships with active control programs in progress. Treatments under this alternative could result in a decrease of about 1,430 AUMs by 1998. This represents an approximately 15 percent reduction in carrying capacity when compared to 1988 AUM levels, or 25 percent less than potential capacity without weeds, and is virtually the same as Alternative A.

Timber. Chemical use implies potential for some damage to conifers, but the impact would be insignificant due the habitat types and limited acreage proposed for treatment.

Water and Soils. The areas selected for treatment would generally be in the lower elevations adjacent to private lands where treatment is already occurring. Due to the locations of these treatment areas, potential contamination is generally limited to non-riparian landscapes. Because of the elevations, the sites treated would be the drier ones and would show a slight benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative C.

Direct action would be taken both in cooperation with adjacent landowners and across the forest. Table IV-8 shows the upper-bound estimates for treatments under Alternative C (if fully funded and implemented).

TABLE IV-8. Treatment Acres – Alternative C

Method	Decade Total	Average Annual
Physical	130	105
Biological	1,400	595
Chemical	6,565	2,740

NOTE: Average annual is more than 1/10th of the decade total because the same site may have to be treated several times during decade for some methods. See Tables II-2, II-3, and II-6 for repeat application frequencies.

Human Health and Safety. Risks to human health and safety would still be very slight, but slightly higher than Alternative B. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. This alternative would result in some reduction in acres of diffuse knapweed, musk thistle, houndstongue, and dalmatian toadflax. It would also slow the expansion the other species. This reduction would be achieved by spraying about 6,600 acres. On these acres there would also be a loss in forbs and shrubs which would reduce ecological diversity. Sensitive plants found on dry sites would be at a higher risk than the two previous alternatives. Only a minor risk is present for sensitive plants on moist sites. A minor area of physical control will have limited effect on ecological diversity and potentially a minor impact on sensitive plants. Biological control efforts should reduce the weed risk to sensitive plants where they are effective.

Recreation. In developed sites this alternative would result in control of weeds in campgrounds, picnic grounds, on beaches and other intensively used areas where weeds detract from the recreation experience. Some people would avoid chemically treated sites and would feel that their recreation opportunities had been reduced.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved. Notification and consultation with Native American Cultural committees could prevent the use of herbicides from impacting Native American religious and traditional values.

Visual Quality. This alternative would allow the treatment of recreation facilities, administrative sites, and other areas with herbicides. Noticeable visual impacts appear largely limited to these areas.

Wildlife. Assuming that the control measures under this alternative would reduce some weed spread somewhat more than in Alternative B, about 5 percent of winter range forage production potential might be lost after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. Possible impacts to the aquatic resources would be greater than in B, but still small. Impacts could come from herbicide spills or grazing in riparian ecosystems, but should be minimal to nonexistent if proper safeguards and listed mitigation techniques are employed.

Range. Under this alternative, physical, biological, and chemical control measures would be taken on a wide variety of sites. After a site specific analysis, treatments could occur on suitable National Forest sites in active grazing allotments. Treatments under this alternative could be directed toward range allotments if infestations of difficult to control weeds were small (and manageable) or threatened other high value resources. Little or no large scale treatment of spotted knapweed or leafy spurge would be anticipated due to the low likelihood of any significant long term decrease in these weeds. Treatments under this alternative course of action could result in a decrease of an estimated 1,240 AUMs by 1998. This represents an approximately 13 percent reduction in carrying capacity when compared to 1988 AUM levels, or 23 percent less than potential capacity without weeds.

Timber. Some damage could occur to non-target conifers if mitigation measures are not followed. On a forest-wide basis, these effects would be insignificant.

Water and Soils. The areas selected for treatment with chemicals would generally be in the lower elevations adjacent to private lands where treatment is already occurring, and mid-elevation zones that support drier habitats. Treatment of some riparian zones would occur, but these spots would be small. This is due to the limited number of acres that are infested in these zones. Treated sites would generally show a benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative D.

Weeds would be treated both across the forest and in cooperation with adjacent landowners. Chemicals would not be used. Table IV-9 shows the upper-bound estimates for treatments under Alternative D (if fully funded and implemented).

TABLE IV-9. Treatment Acres – Alternative D

Method	Decade Total	Average Annual
Physical	840	790
Biological	1,650	845
Chemical	0	0

NOTE: Average annual is more than 1/10th of the decade total because the same site may have to be treated several times during decade for some methods. See Tables II-2, II-3, and II-6 for repeat application frequencies.

Human Health and Safety. No significant effects would occur.

Vegetation. This alternative has no risk to ecological diversity or sensitive species as a result of chemical use. Expansion of existing weed populations will be similar to Alternative B, although certain species would be limited. Musk thistle, houndstongue, and dalmatian toadflax would show reductions in acreages as a result of physical and biological treatments. On these sites, biological diversity will be maintained or improved, and sensitive plants will have less competitive pressure. A minor risk to sensitive plants exists as a result of grubbing and pulling operations. The more competitive noxious weeds like spotted knapweed, leafy spurge, and goatweed will continue to expand, and the threat of monocultures exists on some of the drier sites.

Recreation. Physical and biological control could improve the quality of some recreation sites, but to a lesser extent than under Alternatives C and E. Those who want to avoid chemically treated areas would not feel that their opportunities were reduced by chemical use. Where grazing is used, some temporary site quality degradation would be caused by the presence of animals and their feces.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved, provided that non-chemical treatment methods are effective and funded.

Visual Quality. Visually, this alternative is very similar to Alternative C, but with less control of leafy spurge. This alternative would be somewhat less effective than Alternative C where chemical control provides less expensive or more reliable control. Lack of herbicide options mean fewer treated acres.

Wildlife. Very little knapweed would be controlled under this alternative, so big game winter range effects would be similar to those estimated for Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. The elimination of the use of chemical herbicides in this alternative results in reduced risks to the fisheries and aquatic resources, compared to alternatives B and C. Grazing used for biological control might have negative impacts if not managed correctly. Impacts to aquatic resources should be minimal if listed mitigation measures are followed.

Range. Under this alternative, only physical and biological control measures would be taken on a wide variety of sites. After site specific review to determine likelihood of success, treatments could occur on suitable National Forest sites in active grazing allotments. Little or no large scale direct control measures on spotted knapweed or leafy spurge would be practical. Treatments under this alternative could result in a decrease of around 1,265 AUMs by 1998. This represents an approximately 13 percent reduction in carrying capacity when compared to 1988 AUM levels, or 23 percent less than potential capacity without weeds.

Timber. No significant effects.

Water and Soils. This alternative would eliminate the risk of any chemical contamination due to weed control activities but would treat approximately 1,635 acres with other methods. The areas selected for treatment would be in the lower elevations adjacent to private lands. Because of the elevations, the sites treated would be the drier ones and would show a slight benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. There would be no significant effects on road activities.

Alternative E.

This alternative would be an aggressive attempt to eliminate noxious weeds across the forest. Table IV-10 shows the upper-bound estimates for treatments under Alternative E (if fully funded and implemented).

TABLE IV-10. Treatment Acres — Alternative E

Method	Decade Total	Average Annual
Physical	170	120
Biological	600	530
Chemical	30,800	12,620

NOTE: Average annual is more than 1/10th of the decade total because the same site may have to be treated several times during decade for some methods. See Tables II-2, II-3, and II-6 for repeat application frequencies.

Human Health and Safety. Risks to human health and safety would be higher than Alternative C, but still very slight. Accident risk would be very small. Workers applying 2,4-D and failing to use protective clothing and procedures would be at highest risk.

Vegetation. Reductions in acreage of most of the noxious weeds can be expected from this alternative, which would be favorable for ecological diversity and maintenance of sensitive species. The use of chemicals on almost 31,000 acres could have a significant impact on sensitive plants, with a high probability of a loss of one or more colonies of a particular plant. Sensitive plants on moist as well as dry sites would be affected. Similarly, ecological diversity on these chemically treated sites would be disrupted by the loss of some forbs and shrubs. The overall impact on vegetation would be negative in the short-term, with a significant chance of loss of some portion or all of a sensitive plant population. Over a longer time frame, ecological diversity should be maintained, but losses to the sensitive plant population could not be recovered. Impacts from physical and biological treatments would be minor.

Recreation. In developed sites this would be the same as Alternative C.

Dispersed recreation would be improved because the spread of weeds would be stopped, and there may be some reduction in weeds across the forest. The effects of the chemical would not be sufficient to cause impact on fish, water quality or wild animals so the only adverse effect to the dispersed recreationist would be felt by those who want to avoid chemically treated areas. Those people might feel that their recreation opportunities had been significantly reduced. This would be a short-term effect.

Cultural Resources. The visual aspect of some historic sites could be reclaimed and preserved. Notification and consultation with Native American Cultural committees could prevent the use of herbicides from impacting Native American religious and traditional values.

Visual Quality. This alternative would have no negative impacts on the visual resource, other than potential short-term impacts of dead and dying weeds. Additional road closures in this alternative would reduce viewing opportunities for vehicular traffic in some parts of the forest.

Wildlife. Assuming that the extensive control measures under this alternative would reduce some weed coverage below today's levels, about two percent of winter range forage production potential might be lost after 10 years. This compares to an estimated loss of three percent of potential today and about 6.5 percent lost under Alternative A. Actual impacts are expected to be less than this. No significant effects are expected on non-big game wildlife.

Aquatic Habitat and Fisheries. The potential for major deleterious impacts to fisheries and aquatic resources is the greatest with this alternative. The extensive use of herbicides proposed increases the risk of accidental spills or overspraying. The severity of such impacts (for instance a spill into a stream) would be the same as alternatives B and C, but the likelihood of such an event would be higher in this alternative. The actual risk of significant impacts is still quite low, provided that proper safeguards and listed mitigation measures are followed.

Range. Under this alternative, the mere presence of a weed would be considered an unacceptable impact, and an attempt to eliminate all weeds from the Lolo National Forest would be made using all available control measures. All active and inactive range allotments would be included in this high emphasis control effort. Treatments under this alternative could result in a decrease of an estimated 175 AUMs by 1998. This represents an approximately 2 percent decrease in carrying capacity when compared to 1988 AUM levels, or 13 percent less than the potential capacity without weeds.

Timber. Some damage could occur to non-target conifers if mitigation measures are not followed. On a forest-wide basis, these effects would be insignificant.

Water and Soils. There would be little consideration for elevational differences and all weed infestations would be attacked aggressively. This alternative would have the highest risk of contamination to the environment due to the large number of acres treated. Treatment of some riparian zones would occur but these spots would be small, because of the limited number of acres that are infested in these zones. Due to the large number of acres treated this alternative would show a benefit or reduction in sediment production and water yield increases. On the whole, this alternative would have no significant impacts on water and soils.

Minerals. There would be no significant effects on minerals resources or activities.

Roads. Additional road and area closures for weed control purposes could reduce motorized access to some areas.

UNAVOIDABLE ADVERSE IMPACTS.

Some degree of the weed impacts discussed in this chapter are unavoidable. Mitigation measure for weed prevention, as well as control measures, can lessen but not eliminate these impacts. The impacts of the control measures can be avoided to the extent that the mitigation measures listed in Appendix D are effective. There will always be some probability that the mitigation measures are not 100 percent effective.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY.

Neither tolerance of weeds nor weed control is a short-term use. It is possible that weeds could reduce the long-term productivity of big game winter range, livestock grazing, and to a slight extent recreation resources. See those sections in this chapter for further discussion.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES.

The ***irreversible*** commitment of resources refers to the consumption or loss of nonrenewable resources such as oil and gas or soil. None of these alternatives includes an irreversible commitment of resources. If mitigation measures are not properly followed, it is conceivable that some colonies of sensitive plants could be lost to chemical weed control efforts.

The ***irretrievable*** commitment of resources refers to the loss or consumption of renewable resources. Any loss of renewable resources projected in the EIS (for instance, reduction in big game winter range or livestock forage potential) could be retrieved in theory at any time in the future by employing weed control measures.

POSSIBLE CONFLICTS WITH THE PLANS OR POLICIES OF OTHERS.

Lack of weed control in Alternative A could conflict with State, county, and adjacent landowners' weed control plans. The other alternatives offer the latitude for cooperative weed control actions. Use of herbicides in alternatives B, C, and E could conflict with the land ethic of some neighboring landowners or forest users who are opposed to herbicide use.

ENERGY REQUIREMENTS.

Energy requirements would increase in direct proportion to increases in weed control intensity. Energy consumption would be limited to vehicle fuel for inventorying, project operations, and monitoring.

CUMULATIVE AND CONNECTED ACTIONS.

Possible cumulative effects are discussed in the Human Health and Safety section of this EIS. If an alternative including chemical control methods is selected, cumulative acres for projects planned each year will be reviewed to ensure that total sprayed acres for the forest fall within the parameters analyzed in this EIS.

The project-specific environmental analyses for cooperative projects with other agencies or landowners will consider the weed control activities of the cooperators as cumulative and connected actions.

CHAPTER V – LIST OF PREPARERS

Chapter V.
LIST OF PREPARERS

INTERDISCIPLINARY TEAM

NAME, PROFESSIONAL DISCIPLINE, EXPERIENCE (YEARS)	PROFESSIONAL EDUCATION	WRITTEN PARTS OF EIS
Skip Barndt Soil Scientist (26)	**BS** Soils – Geology	Water and Soils
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Terry Egenhoff[1] Biologist (8)	**BA** Biology **MS** Environmental Studies *Graduate work in Forestry*	WRITER/EDITOR, graphics, desktop publishing
Marcia Hogan[2] Public Affairs Specialist (11)	**BA** Liberal Arts **BA** Forestry	Consultation with Others
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[1] Joined ID team in early 1988. [2] Joined ID team in late 1988. [3] Left ID team in early 1988.

Between mid-1987 and late-1989, the interdisciplinary team met several times for scoping, to develop alternatives, to identify analysis needs and methods, to review analysis results, and develop mitigation measures. The other contributors helped perform analysis and/or write sections of the EIS. Both groups reviewed early drafts of the EIS as it was written. Other reviewers who commented on earlier drafts include

Jim Olivarez (Regional Office); Bob Meuchel, Chuck Spoon, Dick Seitz, Jerry Williams, and Skip Rosquist (Supervisor's Office); Dave Stack (Missoula Ranger District); Greg Munther (Ninemile Ranger Distict); and Rollie Ortegon (Seeley Lake Ranger District).

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CHAPTER VI – CONSULTATION WITH OTHERS

Chapter VI.
CONSULTATION WITH OTHERS

This chapter has three sections:

- **Public Involvement Summary:**
  - Issue Development,
  - Analysis of Public Responses to the Issues Letter,
  - DEIS Distribution,
  - Public Meetings;
- **List of Agencies, Organizations, and Persons to Whom Copies of the DEIS Were Sent;**
- **Comments on the DEIS:**
  - Summary of Comments and Forest Service Responses,
  - Individual Comment Letters and Forest Service Responses.

Public Involvement Summary.

Issue Development.

In November 1987, we mailed a letter to about one thousand people on our Forest Plan mailing list. The letter included a list of eight issues and asked whether we were addressing appropriate issues for a weed management EIS. We received 62 responses, and they are summarized below.

In addition to the letter, we notified the public through local press releases and by filing a "notice of intent" in the Federal Register. We also consulted other agencies such as the U.S. Fish and Wildlife Service and the Montana Department of Fish, Wildlife, and Parks as we prepared the DEIS.

After reviewing the responses summarized below, we refined our set of issues to the thirteen presented in Chapter I.

Analysis of Public Responses to the Issues Letter.

Abstract – *Responses to the letter indicate that the public is not extremely polarized over issues surrounding weed impacts and control methods. A couple respondents stated either that any method should be used to control weeds, regardless of impacts on other resources or costs; or that chemical herbicides should not be used in any situation. Most responses, however, were somewhere in the middle.*

Most people believe the threat of noxious weeds is significant. Many stated that cooperation with others involved in weed control activities is essential to successfully containing and eventually reducing noxious weeds. Many feel that using various management tools, including chemicals, is the only way to effectively treat weeds. However, many people are concerned about chemicals and want the Forest Service to use them wisely (only when necessary, in small areas, and in small doses, until safe biological controls can be found). Many said prevention is the best cure; most people would like the Forest Service to improve it's land management practices by reducing the amount of soil disturbance and treating exposed areas. Some felt that public education is important to controlling the spread of these weeds.

Question #1

How significant are the impacts of noxious weeds on forest resources?

Many who responded to this question thought the impact of noxious weeds on Lolo National Forest resources was significant. A few respondents thought the current impact of the weeds was minor, but on the increase. Several people didn't know how significant noxious weeds were on the forest, assuming that would be determined through the EIS process.

Those who thought the impact of noxious weeds on forest resources was significant voiced several areas of concern. The elimination or reduction of indigenous plants and the impact this was having on degradation of wildlife habitat and livestock grazing was a concern for many. Several people were concerned with the effect noxious weeds were having on cut-over areas. Their interest was whether the weeds were impeding the regeneration of seedlings. A few people worry that noxious weeds are "out competing" native and threatened and endangered plant communities. In addition, a number of respondents voiced concern over the impact noxious weeds were having on the forest as a whole; listing the detrimental effects from weeds on soils, water quality, esthetics, vista, recreation, and economics.

Several responses to this question suggested noxious weeds did not have as significant an impact on forest resources as did Forest Service management practices. The Forest Service's failure to properly treat disturbed land was highlighted as the problem. These disturbed sites are blamed for harboring noxious weeds and continually providing seed sources for new infestations.

A small number of people viewed the impact of noxious weeds on forest resources as significant, but not as significant as using herbicides. On the other hand, the same number of people viewed the impact of noxious weeds on forest resources as significant, with the belief that spraying all forest roads was essential to control weeds.

Question #2

Under what circumstances will we take action to control weeds to protect National Forest resources and values?

The responses to this question were varied. A number of respondents suggested the forest should take action now, under any circumstances, or at least take action as soon as a weed community is identified. Others were concerned that the Forest Service would take action when it was too late, suggesting the Forest Service has little knowledge of vegetation and doesn't care what weeds were out there.

Some comments suggested the Forest Service should take action against weeds at certain levels of infestation. One respondent said the agency should react when weeds reached "epidemic" levels, others believe the Forest Service should set a goal to reduce weeds. Where the weeds are established, the agency should try to confine and then eradicate them. Others determined the Forest Service should target small infestations, especially when they threaten to spread.

It was also suggested the agency look at cooperative efforts to manage weeds, working together with other agencies and their weed programs on joint projects. This way the agencies could manage together areas of existing infestations, areas with no infestations, and work in tandem identifying new weeds and new infestations.

Many other respondents offered comments that centered around taking action on weeds when other resources were affected. One suggested eradicating weeds would probably be affordable only around highly valued recreation areas. However, prevention of further spread of noxious weeds was addressed as the real cure. Several people suggested the Forest Service take action when private land adjacent to agency land was affected by noxious weeds located on federal property. A number of respondents offered the idea that noxious weeds were ok until they began crowding out native plants. A few assumed the Forest Service would take action when the health of the range was at risk. A high number of respondents proposed the Forest Service take action against weeds when the "balance of the ecosystem" was at risk. Maintaining the biological integrity of the whole Forest was important.

A limited number of people recommended an on-going spray program to eradicate noxious weeds. Several others suggested the Forest Service weed effort should include limited spraying, especially in newly disturbed areas and on heavily used roads, in conjunction with reseeding.

A few respondents maintained that trying to eradicate established noxious weeds was only part of the solution. The other part centered on initiating "proper long-term land management practices," suggesting that this was "vital to protecting and rehabilitating" forest resources.

A small number of people advised the Forest Service consider the economics of a situation when determining when to take action to control weeds. Suggesting that cost versus benefits and the probability of success be considered.

Finally, one respondent said the Forest Service should take action to control weeds only when there were no identified "long or short-term negative impacts" on other resources in the forest. Two others proposed that weeds should only be controlled when they are not native to local ecosystems.

Question #3

How can the Forest Service work with adjacent landowners, weed boards, and other interested parties to protect economic and social values from impacts of weeds?

Cooperation was the overwhelming response by the majority of people who responded to this question. The variation in the responses came in determining how the agency should be involved in this cooperative effort. A large number of respondents believe controlling noxious weeds should be a cooperative effort between the federal, state, county and local governments, private landowners including Champion and Plum Creek, weed boards, the University, native groups and permittees. This cooperation should take many forms, including: sharing information, equipment and dollars; continuity between projects; and follow-up and monitoring of projects. Reasons for cooperation centered on

the noxious weed problem being a public problem, the Forest Service didn't cause it and they can't solve it. If all seed sources are not involved in the solution, the problem will continue. Some believe if the Forest Service can not get all owners involved in the weed problem, they should understand and respect this. On the other hand, some believe all need to accept responsibility, demanding adjacent property owners to participate or institute tax based funding to support the weed effort.

As far as what the Forest Service role should be in noxious weed management, several people wanted the agency to take the offensive, be active and be a leader. A few believe the agency is well behind other organizations in the area of weed management and the Forest Service ought to follow their lead. Still others believe the Forest Service should serve as moderator with respect to noxious weed management, facilitating cooperation by pulling in all interested parties. Some suggest the Forest Service provide a management action plan and policies identifying the agency's long-term commitment to the management of noxious weeds. A number of people believe the Forest Service should use the skill and knowledge of the agency's personnel to assist in managing the noxious weed problem. Finally, a few respondents suggested the Forest Service assist the noxious weed effort by providing any available funds.

Forest Service development of a public service program that would educate the public on the threat of noxious weeds was advice offered by a large number of respondents. Several thought magazine and news articles would be helpful. In addition, a few people suggested the Forest Service use the agency's skills and knowledge to educate landowners regarding proper land management practices and how to minimize the spread of noxious weeds. Topics here should be: long-term impacts to the soil by overgrazing, road construction and cultivation; and the appropriate way to apply chemicals. Interestingly, several people responded to this question of cooperation with adjacent landowners by proposing the Forest Service reduce surface disturbance activities such as road building, which can set the stage for noxious weed infestation.

A few comments advised that the Forest Service, in conjunction with cooperation and coordination on weed control, stress manual control of weeds; emphasizing that chemicals and mechanical control devices were not effective over large areas. Several private landowners were concerned about chemical application by anyone because of the possibility of the chemicals getting into drinking water or water used for irrigation purposes. They wanted to stress the importance of considering downstream users if chemical application for weed control is considered.

Finally, a few respondents suggested economic and social values, as considered by this question, were secondary values when considering weed control management. The primary value being protection of natural resources.

Question #4

How can we control weeds being spread by Forest Service management activities?

Responses to this question focused on three major areas: level of analysis done by the Forest Service; treatment of current weed infestations; and Forest Service management practices.

Level of analysis – Several respondents suggested the Forest Service do comprehensive planning to control weeds. Their proposals centered on assuming all activities spread weeds. The agency needs to define acceptable levels for each noxious weed for each management area on the forest, analyze how each of these weeds are spread, then determine which activities spread the identified weeds. The agency can then control weeds by controlling the kinds and levels of activities in these management areas.

Additional proposals were to follow conventional guidelines to avoid spreading weeds through agency activities, and use IPM (Integrated Pest Management) to control the spread of weeds.

Treatment of current infestations – Recommendations varied on how the Forest Service should treat current weed infestations. A few people said eliminate the weeds, with the suggestion that federal funds be made available for this effort and that no new areas be open to forest management activities until the Forest Service can show it can control the spread of noxious weeds. Others advocated mowing the weeds before they go to seed and avoiding any harvesting activities after plants had gone to seed. Others suggested using manual controls while at the same time finding some way to use noxious weeds in manufacturing processes.

A large number of respondents thought the Forest Service should consider spraying agency roads. Some proposed spraying newly constructed roads as soon as weeds appear, others believe the Forest Service should spray and eliminate all knapweed on agency roads, instituting an on-going spray program to eradicate weeds. **It is important to note the majority of people who offered spraying as a solution to weed control suggested spraying in conjunction with other alternatives, including, reseeding newly disturbed sites and cleaning the undercarriages of vehicles before entering disturbed areas.**

Finally, one respondent intimated that if the Forest Service had followed State law requiring every landowner to control weeds, the agency would not need to determine how to control current infestations.

Forest Service management practices – Respondents' concerns focused on eight areas involving management practices. **1)** Intensive grazing by livestock and it's impact on spreading weeds is a concern. Several people would like the Forest Service to more closely monitor the impacts cattle are having on National Forest land. **2)** Horse and mule use in recreation areas and how these animals and their feed contribute to the spread of noxious weeds is an issue. Respondents suggest the Forest Service require animal users to carry clean hay or pellets or restrict horse/mule use on public lands. **3)** Several respondents would like to see "operational requirements" for weed free activities for all contractors and permittees.

4) Restricting vehicle use, especially off-road vehicles, was an issue. People see vehicles as a source for weed infestation, as the under carriages of conventional vehicles and ATV's carry weed seeds. **5)** Along this line, people would like to see the Forest Service police it's own vehicle use in weed infested areas and the vehicles and equipment of permitees and contractors.

6) A large number of respondents would like to see the Forest Service reduce the number of activities that disturb soils in areas infested with noxious weeds or that are prime for new infestations. Reducing road construction; avoiding severe logging sites; reseeding disturbed soils adjacent to new road cuts; after logging, reseeding skid trails and roads; and additional road closures, were some of the recommendations.

7) Several people suggested the Forest Service have employee training in weed identification and the impacts forest practices have on spreading weeds. **8)** Others thought the Forest Service should initiate a prevention education program for the public, employees and contractors, discussing the effects of noxious weeds on forest resources and how the public and employees can assist in halting their spread.

Question #5

What are the management objectives for each weed species?

Responses to this question varied from "kill them"; bring them down to a "normal" level (Pre-1950's); or weeds are sometimes noxious to humans, but may not be noxious in and of themselves. However, a majority of those who responded suggested the management objective for each weed species should be to contain or control its spread, then reduce the infestation. Eradication was discussed but most concluded this would be expensive and may not work.

Several people thought the Forest Service ought to coordinate management objectives for each weed species with the Counties, in cooperation with the Universities. Several others recommended the Forest Service use State noxious weed management standards, following their guidelines for control of identified noxious weeds. Establishing goals and objectives for management of each noxious weed which would include such things as priorities for each management area and allowable infestation levels. One respondent proposed the Lolo confine its weed control efforts to non-native weed species in competition with native plants.

As stated above, a large number of those responding to this question would like to see the Forest Service's management objectives for noxious weeds center on containing or controlling existing weed infestations. Following this, people would like the agency to try to prevent any further outbreaks and begin to reduce those contained or controlled areas.

Of those who discussed specific weed problems, knapweed was the biggest concern, followed by leafy spurge. Several respondents did discuss the goal of eradicating certain noxious weeds, especially if the infestations were new and small. However, most who proposed eradication concluded this was an ideal solution to the noxious weed problem, but not a practical one. The expense and the uncertainty of success were cited as reasons making eradication impractical.

Question #6

What might be the impacts of various management tools used for weed control, including but not limited to mechanical treatments, biological control, intensive hand labor, and pesticides?

In answer to this question, several respondents suggested the Forest Service use the "Integrated Pest Management" approach to noxious weeds. Others thought the Forest Service should review all of the publications on managing noxious weeds and this material should be discussed thoroughly in the agency's EIS, listing pros and cons of each management option. One person was concerned that no matter what weed control option the Forest Service considers for any site, they should consult the state's Natural Heritage program to determine if any rare plants or animals live in the area.

The majority of the responses to this question focused on the positive and negative effects of noxious weed treatments. A large number of people urged the Forest Service to use biological controls for the Forest's noxious weed problem. Several of these respondents, who believe biological approaches for weed control are best, realize biological controls may have to work in conjunction with other controls, such as burning and mechanical treatments. One discussed the care that must be given in working with biological controls, as some biological weed treatments can infest other plant species.

There are a significant number of people who have strong advice to give on the use of pesticides/herbicides to control noxious weeds. This issue was polarized. A number of people do not want chemicals of any kind used to control noxious weeds, some just don't like chemicals. Others identified a fear for the "whole" environment when chemicals are used. Arguments against using chemicals centered on the concern for water quality; people exposure to chemicals, especially in recreation areas; chemicals in the air effecting the whole ecosystem; and how chemical use might indirectly effect tribal berry and herb areas.

A large number of people, however, support the use of chemicals to control noxious weeds. Some conclude that biological and mechanical treatments have been tried and have not been effective against noxious weeds, while chemicals have. A few would like to see small selective spraying. Others see chemicals as the only means of control until effective biological controls can be developed. Finally, one respondent concluded that chemicals were the only way to control weeds, but we need to protect the birds, insects and other forest creatures.

Several people did not disclose which type of weed treatment they preferred, offering instead opinions on the pros and cons of each kind of treatment. Respondents collective concerns are grouped below.

Mechanical controls — soil erosion in adjacent streams, problem put off into the future, has limited effectiveness on large areas, and can be expensive.

Biological controls — can impact "non-target" species, and are not currently very effective. **However, many of those responding concurred that when developed, this was probably the long-term solution to the noxious weed problem.**

Hand labor — can be effective in small areas, is expensive.

Pesticides/Herbicides — can have long duration in the soil, can contaminate water, may contaminate "non-target" species, can be more effective and cheaper, and may be dangerous to applicator.

One person concluded that the test seemed to be to figure out how all of these weed treatments could work together effectively against the weed and not adversely effect the environment.

Question #7

Given the current constrained budget, how can we effectively manage noxious weeds?

The responses to this question focused on four areas: education, setting priorities, cooperative efforts, and good land management practices. Several who responded think the Lolo needs to educate politicians and high ranking Forest Service officials about the threat of noxious weeds. Once aware of the immediate need to control noxious weeds, they should support allocating additional funds. Others suggest educating the public on the threat of noxious weeds, enlisting their help and support in controlling weed spread. In addition, a few who responded believe all forest users share in the effort to control noxious weeds, recommending the agency educate and encourage the public to "assist with non-native plant removal."

A significant number of people responded to this question by stating the Forest Service needs to set priorities for how to manage noxious weeds with a constrained budget. Targeting "key" areas, evaluating cost versus benefits, then making professional decisions based on good information. Suggestions for what the agency's priorities should be centered on a containment strategy in crucial areas. Several respondents thought the agency should concentrate its limited resources on new, small infestations in areas that could serve as new sources for larger infestation, such as trailheads and wildlife winter range. Preventing the spread of noxious weeds until a biological control could be found was key for one respondent.

A number of people proposed the Forest Service pursue cooperative projects with others involved in weed control to get the most out of limited resources, completing one project at a time. Simultaneously, the agency should be factoring in weed control costs during project planning asking questions like: what are the weed risks in this new road system; how long will it take new vegetation to come in to avoid weed infestation; and what methods can we use to contain weeds to this area? One person suggested working with major corporations currently studying biological treatments for weed control, using infested Forest Service lands as laboratories. One person proposed the Lolo use prison inmates to pull noxious weeds.

In addition, a large number of respondents stressed prevention of further spread of noxious weeds by promoting good land management practices. People stressed the Forest Service should reduce activities that leave soil disturbed (i.e., road building and over-grazing), while continuing to search for an effective biological weed control method. Many respondents believe biological weed treatments offer the best return for the dollar for long-term weed control.

A few people believe, with the current constrained budget, the Forest Service should use the most effective weed control method we have: chemicals. However, one respondent considers chemicals a bad alternative, even with a limited budget, because of the unknown environmental consequences. Finally, several respondents concluded under a constrained budget, you can't effectively manage noxious weeds. One respondent said the Forest Service "cannot expect a complete triumph over Nature."

Question #8

Please list additional issues, comments, and concerns you feel should be addressed in the process.

The issues, comments, and concerns revealed by this question can be summarized under four headings: containing the spread of noxious weeds; areas of further research; management considerations for the Lolo National Forest; and, issues to be addressed in the EIS. Other issues, comments, and concerns raised but not discussed here have already been covered in earlier question summaries.

Containing noxious weeds — Three of the recommendations under this category focus on money. One respondent said the Forest Service should spend as much money as needed to contain noxious weeds, even if the efficient weed control method was spraying. Another suggested instituting an excise tax based on the Pitman-Roberson Act, where all forest users: utility companies, railroads, tribal groups, and private owners, are taxed to support weed control measures. An additional idea centered on allowing range allotment permittees to treat noxious weeds (spray) and to have their payments adjusted accordingly. Finally, one person proposed the Forest Service issue a certificate for weed free cars. Those who had this identification would be allowed to travel public roads.

Further research — Several respondents see information gaps in noxious weed management, three specific areas were mentioned. Serious research needs to continue in environmental management systems, identifying new biological controls, and developing "ultra specific" pesticides. Without these tools, success in long-term treatment of noxious weeds at an economical price will be elusive. One respondent sees great potential in the Forest Service for testing grasses against weeds. The Forest Service should treat its disturbed sites with common variety grass seed. These grasses could be tested against noxious weed infestations, with the possibility that some of the grasses might provide "effective competition" for weeds. Finally, one individual proposed experimenting with ways to make weed seeds deteriorate while still on the plant, hoping to shorten the plants life span and stifling regeneration.

Management considerations — The comments on management considerations are varied, covering a wide arena of issues. One respondent is concerned the forest not attempt to eradicate all noxious weeds. The value of certain noxious weeds for soil stabilization on disturbed sites (road cuts, mine wastes and over grazed rangeland) and certain weeds value as cover and forage for wildlife, should not be discounted.

Another commented on the forest's public involvement with regards to weed control, suggesting Forest Service management "streamline" the process they use to respond to people concerned about noxious weeds, giving more timely responses. One respondent proposed the Lolo's weed control strategy be flexible enough to deal with "special" situations, allowing the districts the option of using a combination of weed treatments.

Several people recommended the forest educate citizens on the weed issue, offering them a noxious weed "ethic" to work and recreate by. A large number of respondents would like to see the Forest Service improve on-the-ground management practices to slow weed spread. Some see improved agency management practices as a better way to control noxious weeds than any available weed treatments. Prevention is the best cure. Lastly, there

is concern over those individuals who would apply chemicals, if the Lolo's EIS allows spraying. At issue is the quality of training these people receive; the consistency of chemical use, especially around water; the accuracy of the record keeping; and what kind of supervision is required.

Issues for the EIS — A substantial number of people had questions they would like to see the Lolo address during the EIS process. One respondent was concerned whether the U.S. Fish and Wildlife Service would be involved in the EIS process, citing concern for management of wildlife on national forest land and the impact noxious weeds have on winter range. Several people would like the forest to address which biological controls show promise in controlling noxious weeds.

A significant number of respondents believe the EIS should include site-specific information. This information should focus on evaluating areas for threatened, endangered and sensitive species and what impacts weed control treatments will have on them. Of special concern is the impact chemicals would have. Some suggest base-line water quality information be gathered before and after the use of any chemicals. None of these people said the Forest Service should never use chemicals. Of greater concern was that the Forest Service do it's homework before using chemicals. Finally, the importance of monitoring noxious weed treatments was highlighted. Monitoring will aid in identifying the extent of noxious weed infestations and help in evaluating the success of earlier weed control treatments.

Additional information others would like included in the EIS are: how will new species of noxious weeds be identified; when and where is the containment of noxious weeds the best treatment strategy; if the Lolo chooses to use chemicals on certain infestations, how will the applicators be monitored; will those monitoring be licensed applicators?

DEIS Distribution.

On January 5, 1990, we mailed about 950 copies of the 26-page Summary of the DEIS, along with a response form by which people could request a copy of the full DEIS. Some people and organizations were automatically sent copies of the DEIS because they had already expressed interest, or had special expertise or jurisdiction,in the issues covered in the EIS. The full DEIS was mailed out on February 9, 1990. The list on the following page includes all addresses that were sent copy(s) of the DEIS.

Public Meetings.

Many people not on the list picked up copies of the DEIS at one of several public meetings at which this DEIS was discussed:

Missoula County Weed Board (Missoula 2/15/90),
Western Montana Fish and Game Association (Missoula 3/1/90),
Eastern Sanders County Sportsmen's Club (Plains 3/13/90),
Mineral County Weed Board (Superior 3/26/90),
Ninemile Ranger District Open Houses, and
Seeley Lake Community Council Knapweed Program (Seeley Lake 4/24/90):

List of Agencies, Organizations, and Persons to Whom Copies of the DEIS Were Sent.

BACK COUNTRY HORSEMEN OF MISSOULA
MISSOULA, MT 59806

BAUMGARTNER, DANIEL B.
POLSON, MT 59860

BENNETT, JOHN D.
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CHEM-NORTHERN INC.
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CLEARWATER COUNTY WEED SUPERVISOR
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CONFEDERATED SALISH & KOOTENAI TRIBES
NATURAL RESOURCES DEPARTMENT
PABLO, MT 59855

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FOREST LIBRARY
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FORESTRY DEPARTMENT
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HELENA, MT 59620

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THOMPSON FALLS, MT 59873

MONTANA DEPARTMENT OF HIGHWAYS
ATTN: RUSSELL E. WIGG
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MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION LIBRARY
HELENA, MT 59620

MONTANA DEPARTMENT OF STATE LANDS
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REAL ESTATE DEPARTMENT
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MONTANA STATE LIBRARY
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ATTN: TIM MCKAY, COORDINATOR
ARCATA, CA 95521

PETERS, JR., JOHN A.
BONNER, MT 59823

PETERSEN, RODNEY D.
MISSOULA, MT 59803-1854

PHELPS-DODGE MINING
ATTN: CHUCK ROSE
BUTTE, MT 59701

PORITZ, NOAH
BIOLOGICAL CONTROL OF WEEDS
BOZEMAN, MT 59715

POWELL COUNTY WEED DEPARTMENT
DEER LODGE, MT 59722

RAVALLI COUNTY WEED SUPERVISOR
ATTN: HARLAND BAUER
CORVALLIS, MT 59828

REICH, MARVIN A.
MISSOULA, MT

RICE, P.M.
UNIVERSITY OF MONTANA
MISSOULA, MT 59812

ROCK CREEK ADVISORY COUNCIL
MISSOULA, MT 59801

ROEDER, DON
SIMON'S ROCK OF BARD COLLEGE
GREAT BARRINGTON, MA 01230

SANDERS COUNTY WEED SUPERVISOR
ATTN: TOM MILLS
SANDERS COUNTY COURTHOUSE
THOMPSON FALLS, MT 59873

SHOSHONE COUNTY WEED SUPERVISOR
ATTN: GRANT TESTER
WALLACE, ID 83873

SLAGHT, WAYNE
OVANDO WEED GROUP
OVANDO, MT 59854

SLOAN, GARY & MARY
WHITEFISH, MT 59937

SNYDER, PAUL
STEVENSVILLE, MT 59870

STATE OF MONTANA
OFFICE OF THE GOVERNOR
HELENA, MT 59620

STOREY, JIM
WESTERN AGRICULTURAL RESEARCH CENTER
CORVALLIS, MT 59828

TIERNAN, CHARLES F.
MISSOULA, MT

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
PUBLIC HEALTH SERVICE - CDC
CENTER FOR ENVIRON. HEALTH & INJURY CONTROL
SPECIAL PROGRAMS GROUP
ATLANTA, GA 30333

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ASSISTANT SECRETARY FOR OCCUPATIONAL SAFETY & HEALTH
WASHINGTON, DC 20210

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ASSISTANT SCIENCE LIBRARIAN
MISSOULA, MT 59812

USDA, AGRICULTURAL RESEARCH SERVICE
ATTN: DR. RICHARD M. PARRY JR.
BELTSVILLE, MD 20705

USDA, AGRICULTURAL RESEARCH SERVICE
RANGELAND WEED LAB
MONTANA STATE UNIVERSITY
ATTN: DR. P. C. QUIMBY
BOZEMAN, MT

USDA, ANIMAL & PLANT HEALTH INSPECTION SERVICE
HYATTSVILLE, MD 20782

USDA, FOREST SERVICE
CLEARWATER NATIONAL FOREST
ATTN: KEN ANDERSON
OROFINO, ID 83544

USDA, FOREST SERVICE
CUSTER NATIONAL FOREST
BILLINGS, MT 59103

USDA, FOREST SERVICE
DEERLODGE NATIONAL FOREST
PHILIPSBURG RANGER DISTRICT
PHILIPSBURG, MT 59858

USDA, FOREST SERVICE
ENVIRONMENTAL COORDINATION STAFF
ATTN: DAVID E. KETCHAM
WASHINGTON, DC 20013

USDA, FOREST SERVICE
ATTN: JIM VAN DENBURG
FLATHEAD NATIONAL FOREST
KALISPELL, MT 59901

USDA, FOREST SERVICE
ATTN: PAUL BECKLEY
FLATHEAD NATIONAL FOREST
KALISPELL, MT 59901

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FLATHEAD NATIONAL FOREST
SPOTTED BEAR RANGER DISTRICT
HUNGRY HORSE, MT 59919

USDA, FOREST SERVICE
HELENA NATIONAL FOREST
LINCOLN RANGER DISTRICT
LINCOLN, MT 59639

USDA, FOREST SERVICE
LEWIS & CLARK NATIONAL FOREST
ROCKY MOUNTAIN RANGER DISTRICT
CHOTEAU, MT 59422

USDA, FOREST SERVICE, R-1
PLANNING, PROGRMMING, & BUDGETING
MISSOULA, MT

USDA, FOREST SERVICE
WESTFORNET - SEATTLE
UNIVERSITY OF WASHINGTON
SEATTLE, WA 98195

USDA, RURAL ELECTRIFICATION ADMINISTRATION
ENVIRONMENTAL POLICY OFFICE
WASHINGTON, DC 20250

USDA, SOIL CONSERVATION SERVICE
GREEN MOUNTAIN CONSERVATION DISTRICT
TROUT CREEK, MT 59874

USDA, SOIL CONSERVATION SERVICE
ENVIRONMENTAL COORDINATOR OF ECOLOGICAL SCIENCES
WASHINGTON, DC 20250

USDI, BUREAU OF LAND MANAGEMENT
MISSOULA, MT 59801

USDI, OFFICE OF ENVIRONMENTAL AFFAIRS
WASHINGTON, DC 20240

USDI, FISH & WILDLIFE SERVICE
ENDANGERED SPECIES FIELD OFFICE
HELENA, MT 59626

USDI, NATIONAL PARK SERVICE
GLACIER NATIONAL PARK
WEST GLACIER, MT

USDI, NATIONAL PARK SERVICE
ROCKY MOUNTAIN REGIONAL OFFICE
DENVER, CO 80225

WATSON, VICKI
MISSOULA, MT 59801

WEISEL, GEORGE
MISSOULA, MT 59803

WETZLER, EVELYN & BONNIE
THOMPSON FALLS, MT 59873

WHITTAKER, GEORGE
MISSOULA, MT 59806

WILDERNESS SOCIETY
NORTHERN ROCKIES OFFICE
ATTN. MICHAEL D. SCOTT
BOZEMAN, MT 59715

WILLIAMS, CARTER
GREAT FALLS, MT 59403

WILSON, HARRY E.
BREMERTON, WA 98312-2908

Comments on the DEIS.

Summary of Comments and Forest Service Responses.

Due to delays in printing, mailing, and publication of the *Notice of Availability* in the ***Federal Register***, the comment period for the DEIS was open until April 16, 1990. We received 35 written comments. Those letters are indexed in Table VI-1. First we'll summarize the comments and Forest Service responses, then we'll reprint each comment letter and itemized Forest Service response.

The three most commonly received comments were:

☐ The Lolo Forest has an excellent (or good) record for resource management and the DEIS is a well written document. Variations of this comment expressed trust that the Lolo will make a good resource based decision on what is recognized as a tough issue. **(11 letters)**

☐ Doing something is an improvement over doing nothing. Doing nothing is unacceptable. Expectations have risen for action on the weed problem as a result of our DEIS. **(11 letters)**

☐ Alternative C seems to be the best balance of any of the alternatives. (several letters expressed a preference for one of the other alternatives but stated that Alternative C was the best balance when all factors were considered.) **(11 letters)**

Forest Service Response: Comments like these are not addressed in the written Forest Service responses, but the will be considered by the Forest Supervisor when he makes his decision. The Forest Supervisor does have the option to mix elements of different alternatives in his final decision (for instance, he could choose the biological and physical actions in Alternative D, and the level of chemical treatment in Alternative C. The decision and rationale used in making it will be explained in the Record of Decision, which is a separate document to be prepared after the FEIS is completed.

Three other comments that were included in a significant number of letters were:

☐ Biological control is preferred over chemical control, however commentors agreed that there are times when chemical control measures are necessary. **(8 letters)**

Forest Service Response: Comments like these are not addressed in the written Forest Service responses, but the will be considered by the Forest Supervisor when he makes his decision.

☐ Roads contribute to weed spread. Closure of roads should be part of the weed management program. **(8 letters)**

Forest Service Response: Appendix D now includes a new management requirement to explicitly state that noxious weed factors will be considered when making Travel Plan (road closure) decisions.

The proposed Forest Plan Amendment (Appendix I) includes explicit wording to include weed consideration in road closure decisions (Forest Standard 52).

☐ The DEIS underestimates the economic impact of weeds. **(8 letters)** For example:

- Economic impacts from weeds are underestimated.
- The economic impact to landowners adjacent to weed infested National Forest land is underestimated.
- National Forest forage loss and its impact on outfitters and recreational stock users is underestimated.

Forest Service Response: We did not attempt a comprehensive economic analysis. Too many factors cannot be quantified in economic terms. Our strategy for economic analysis was to limit our discussion to those resources for which we have a basis for quantification. We felt comfortable doing that with only two resources: 1) livestock forage, and 2) big game winter range. Even those two areas are fraught with uncertainties, so much so that the resulting numbers should only be used for general comparison between the alternatives, not in any attempt to derive absolute dollar values for economic effects of weeds or weed control. This in no way is meant to imply that these are the only costs and benefits of importance. The Forest Supervisor will consider non-market and subjective issues as well as quantified economic information when he makes his decision.

Other comments included:

☐ There is a need for better and increased weed education both within and outside the Forest Service. Increased budget is needed for this activity. **(5 letters)**

Forest Service Response: Comments like these are not addressed in the written Forest Service responses, but the will be considered by the Forest Supervisor when he makes his decision.

☐ Joint efforts are needed between agencies and private landowners to tackle the weed problem effectively. **(4 letters)**

Forest Service Response: Comments like these are not addressed in the written Forest Service responses, but the will be considered by the Forest Supervisor when he makes his decision. Our action alternatives do focus on cooperation with adjacent landowners.

☐ Special attention needs to be given to backcountry areas and backcountry trailheads (especially the Great Burn and designated wilderness areas). **(4 letters)**

Forest Service Response: The discussion of Control Priorities in EIS Chapter II includes concern for backcountry, administrative pastures, and newer, less extensive weed species as the highest-priority situations for weed control.

☐ Prefer Alternative E, however feel that it was not practical, so chose Alternative C. **(4 letters)**

Forest Service Response: Comments like these are not addressed in the written Forest Service responses, but the will be considered by the Forest Supervisor when he makes his decision.

☐ It makes sense to focus on the perimeter of existing weed infestations (using spot or roadside spraying) and emphasize preventative measures. **(3 letters)**

Forest Service Response: We agree with the logic of a "perimeter strategy." We tried to use similar logic when we developed the species-specific control objectives for each alternative. We also used this logic to develop the general control priorities discussed in Chapter II.

☐ The effects on native, exotic, and/or threatened, endangered or sensitive plant species have not been researched adequately, and have been underestimated in the DEIS. **(3 letters)**

Forest Service Response: Our assessment of effects on native plant communities and threatened, endangered, or sensitive species is based on the best information we could find regarding noxious weeds in our forest environments. We have seen no evidence to indicate that our estimated effects are understated.

We agree that additional information is needed to fully understand vegetation dynamics as they relate to the introduction of exotics. However, we do have ecological models for these changes which can be used to predict potential change. The USDA Animal and Plant Health Inspection Service has been searching for and studying native biotic control agents that are found on noxious weeds to see if adaptation to these species is occurring. The development of a native rust on Canada thistle is currently under study as a result of this effort.

Individual Comment Letters and Forest Service Responses.

Table VI-1 lists the 35 comment letters and the identification number we assigned to each letter. Following the table, each letter is reprinted alongside itemized Forest Service responses.

We wrote written responses only for substantive comments on the accuracy or content of the DEIS. Comments that offered opinions often do not have written responses, but all those comments will be considered by the Forest Supervisor as he makes his decision.

Table VI-1. Index to DEIS Comment Letters

Letter	Page	Name	Agency or Organization	City	State
0	VI-14	Ray Beck	State of Montana Conservation Districts Bureau	Helena	Montana
1	VI-16	Jim Barr		Alberton	Montana
2	VI-18	John B. & Mary Anne Lynes		Darby	Montana
3	VI-19	Joan Bird	Montana Nature Conservancy	Helena	Montana
4	VI-20	Linda Helding	Five Valleys Audubon Society	Missoula	Montana
5	VI-21	Willis J. Heron		Missoula	Montana
6	VI-22	Lorrie Woods	Champion International Corporation	Milltown	Montana
7	VI-23	Don Mergenthal		Augusta	Montana
8	VI-25	Dean & Kathy Solheim		Huson	Montana
9	VI-27	Bill Fallis		Frenchtown	Montana
10	VI-32	Robert W. Demin		Huson	Montana
11	VI-34	Richard G. Ramberg & Robert W. Demin	Nine Mile Livestock Association	Huson	Montana
12	VI-36	John R. Swanson		Minneapolis	Minnesota
13	VI-37	Charles F. Teirnan		Missoula	Montana
14	VI-38	Max Kummerow		Missoula	Montana
15	VI-45	Dr. A. Lawrence Christy	USDA Agricultural Research Service	Beltsville	Maryland
16	VI-46	Willis Curdy	Back Country Horsemen	Missoula	Montana
17	VI-47	Robert F. Stewart	USDI Office of Environmental Affairs	Denver	Colorado
18	VI-48	Bruce Icenoggle		Plains	Montana
19	VI-50	Dr. John R. Lacey	Montana State University Extension Service	Bozeman	Montana
20	VI-53	Austin Urion	Eastern Sanders County Sportsmen Club	Plains	Montana
21	VI-55	Anne Bradley	Montana Native Plant Society	Missoula	Montana
22	VI-58	Fred H. Mass		Palm Springs	California
23	VI-60	Ralph Thisted, Lester Robinson, & Richard Ramberg	Upper Nine Mile Weed District	Huson	Montana
24	VI-62	Kevin G. Chamberlain	Mineral County Extension Office	Superior	Montana
25	VI-65	Jerry Wells	Montana Department of Fish, Wildlife, & Parks	Missoula	Montana
26	VI-66	Wayne Slaught	Ovando Valley Weed Group	Ovando	Montana
27	VI-67	William J. Otten	Missoula County Weed District	Missoula	Montana
28	VI-69	Fred Cavill		Plains	Montana
29	VI-70	Jean & Terry Melton		Plains	Montana
30	VI-71	James Phelps	Montana Audubon Council	Billings	Montana
31	VI-72	Harry E. Wilson		Bremerton	Washington
32	VI-73	John F. Wardell	United States Environmental Protection Agency	Helena	Montana
33	VI-76	David S. Johnson	Montana Department of Highways	Helena	Montana
34	VI-77	Eleanor Danesh		Huson	Montana

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

STAN STEPHENS, GOVERNOR

LEE METCALF BUILDING
1520 EAST SIXTH AVENUE

STATE OF MONTANA

DIRECTOR'S OFFICE (406) 444-6699
TELEFAX NUMBER (406) 444-6721

HELENA, MONTANA 59620-2301

MEMORANDUM

TO: Orville Daniels/Terry Egenhoff
Lolo National Forest
Building 24, Fort Missoula

FROM: Ray Beck
Conservation Districts Bureau Ray

DATE: February 2, 1990

RE: DEIS Noxious Weed Management

The following should be included in all alternatives:

1. Required seeding of all new road cut and fills. Seed establishment should be evaluated 1, 2, and 3 years after seeding and reseeded, as necessary. A

2. Encourage users of the Lolo National Forest through an aggressive public information program to abide by recommended practices designed to reduce the spread of noxious weeds into the forest:

a. Use of weed seed free hay,
b. Washing trucks, horse trailers and animals' feet prior to travelling to forest trailhead,
c. Digestive cleansing of pack animals for 1-2 days prior to entering forest. B

3. Public information program to inform forest users of practices which will reduce or minimize the spread of noxious weeds. The information program could include:

a. Radio spots,
b. Signs at every trailhead,
c. Signs at outdoor retail stores,
d. Presentations at area schools; or addendum to the Missoula C.D.'s Weed Education Program,
e. Feature articles in newspapers: the Missoulian, local weeklies, C.D. newsletters, Agriculture publications (Farmer-Stockman, Prairie-Star, Agri-News),
f. Weed tours in conjunction with local weed board, Conservation District, 4-H, or other organizations. C

CENTRALIZED SERVICES DIVISION (406) 444-6700 | CONSERVATION & RESOURCE DEVELOPMENT DIVISION (406) 444-6667 | ENERGY DIVISION (406) 444-6697 | OIL AND GAS DIVISION (406) 444-6675 | WATER RESOURCES DIVISION (406) 444-6601

Forest Service Response
LETTER 0:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: Road revegetation requirements are included in the management requirements for ground-disturbing activities under all alternatives (See FEIS Appendix D).

B: Similar "stock-cleansing" requirements are included in the Management Requirements for all alternatives in FEIS Appendix A. Administrative and permittee stock-users will be required to follow these guidelines, and we will actively encourage others to follow them as well.

C: The level of public information activities is intentionally varied among the alternatives—see the alternative descriptions in FEIS Chapter II. The indirect action elements of each alternative was tailored to the general objective of each alternative.

D: FEIS Appendix D includes several Management Requirements that are specifically designed to minimize the risk of water contamination. These requirements apply to all alternatives.

E: All action alternatives include a Biological Program to support non-chemical weed control research (see FEIS Chapter II, description and comparison of alternatives). Each weed control project will also include a monitoring plan to collect information on weed control effectiveness (see the Monitoring Plan in Appendix C).

February 2, 1990
Page 2

Program alternative C seems to be the best balance of cost, treatment effects, and environmental protection. Careful attention must be paid to protecting surface and groundwater quality from percolation or overland runoff of chemicals. D

Mechanical and biological treatments are preferable to chemical treatment, but may not be effective enough at this time to contain and suppress weed infestations. Continued research by the Lolo Forest is recommended to improve the effectiveness of these preferred treatments. E

sk

1

February 3,1990
4390 Petty Creek Rd.
Alberton Mt. 59820

In Reply to:1950/2200

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA MONT.
FEB 6 1990
RECEIVED

To; Terry Egenhoff
Lolo National Forest
Bldg. 24 Fort Missoula
Missoula Mt. 59801

Dear Terry,

Thanks for the information on the noxious weed program. It is difficult for the lay person to comment with any degree of validity on a subject as varied and complex as weed control. If it wasn't as it is, we would not have a problem. It is rather obvious that the so called experts in the field are at complete odds as to the ultimate solution.

There have been far too many cases in the past where the expert solutions involving toxic chemicals have been completely wrong to the detriment of the environment and those persons within that environment. Like me for instance.

I have lived since 1971 at the mouth of Printers Creek on Petty Creek. My domestic and irrigation water supply is Printers Creek. I am concerned, naturally about the use of 2-4-D,Tordon,and other toxic pesticides in the drainage supplying my water. I am NOT impressed with the little charts and graphs in the EIS attempting to tell me that these chemicals pose no risk. I resent these "pats on the head" that have been wrong way too many times of late. We had, ten or so years ago, a small herd of goats. One summer the county came with their spray truck and sprayed the weeds (also a number of nice trees) along the roadway. That winter, I spent several miserable hours up almost to my shoulder in a nannys birth canal trying to help them give birth to the most hideously deformed dead kids no one should ever see.

Obviously I do not support weed control by herbicides.

A

Forest Service Response
LETTER 1:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: The risk data presented in the EIS are the best that we could find. The EIS does not attempt to say that these chemicals pose no risk. It does try to quantify the known risks and place them in a context that compares them to other risks.

B: Issues specific to particular places will be evaluated in separate project analyses conducted by the district rangers. The Ninemile District Ranger will be responsible for deciding what, if any, weed control activities will be scheduled for National Forest lands in the Petty Creek area.

C: While preparing this EIS, we developed over 30 ways to prevent or alleviate weed spread. These measures apply to all of our management activities, and are included in all alternatives (see Appendix D of the EIS).

D: Road-closure decisions are made during project planning (for instance a timber sale), usually conducted by district rangers. Each project decision must weigh many environmental issues and social values, including the values of interest groups opposed to road closures. Your views can be most effectively expressed through involvement in project-level environmental analysis at the ranger district.

2.

I have the opinion of Celestine Lacy* of Helena, that the use of herbicides in the Petty Creek area would be a study in futility. Too little, way too late. I am aware that the EIS states that each area would recieve its own evaluation as to the proper management program. I would hope that would eliminate the use of chemicals in Petty Creek.

B

It would seem to me that the prevention of spreading would be a valid program. It is rather obvious to anyone who spends any time in the forests that Knapweed spreads into disturbed ground. Most logging roads and landing areas are solid Knapweed. A skid road down the ridge point south of the mouth of Johns creek across from my property was seeded by Forest Service people I presume, and has no Knapweed infestation at all. It can be done, without poisons, in my opinion backed by personal observations.

C

I would also challenge the closure of roads as a part of a weed management program. Vehicles could and probably do spread weed seeds, but so do animals, and to a vastly greater degree than the occaisional vehicle passing over an infested road. It seems that the latest solution to most problems the Forest Service is faced with is to close the roads. The management of Public Lands by excluding the public is to me an unacceptable situation. We, the general public, are the ones that hired you people to look after our woods , so to speak, and don't like it when you appear to yeild to pressure groups; logging, hunting, recreation, environmentalist, etc. and close off roads as a solution to a problem. It is not, to me anyhow, a fair and equitable thing to do.

D

Thanks Terry for the chance to speak my piece.

Sincerely,

Jim Barr

*P.S Celestine Lacy is a very well thought of expert on weed control. She lives in Helena.

2

RECEIVED
FEB 13 1990

Lolo Natl. Forest:

In regard to your Noxious Weed Management, we support a plan where biological controls are taken, & no chemicals are used.

We also feel overgrazing by cattle is a main ~~[illegible]~~ contributor to the spread of noxious weeds. Grazing allotments must be carefully monitored. A

[signature]

Mary Anne Lynes

Forest Service Response
LETTER 2:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: The EIS recognizes cattle grazing as one of many weed transportation and ground-disturbance factors contributing to weed spread. Weed prevention and control issues are now included as range allotment management plans are revised. Appendix D in the EIS includes several weed-prevention mitigation measures under range activities.

MONTANA NATURE CONSERVANCY

February 13, 1990

Mr. Orville Daniels
Forest Supervisor
Lolo National Forest
Building 24
Fort Missoula, MT 59801

FEB 14 1990
RECEIVED

Dear Orville:

Thank you for offering the opportunity to comment on the Lolo's Noxious Weed Management DEIS. The Nature Conservancy is also in the difficult business of weed control in our management of over 1000 preserves nationwide.

The Montana Nature Conservancy is in favor of Alternative C, with the understanding that chemical herbicides should be a last resort, and that areas slated for broadcast herbicide control be inspected by a botanist qualified in rare species identification.

It is technically true that there are no known federally listed Threatened or Endangered species on the Lolo Forest, however, we still consider our knowledge of botanical occurrences in Montana to be primitive, and request caution in your weed control practices. Although weeds have a significant negative impact on many forest resources, including rare plants, overeager control methods could have an even more destructive effect.

A

In general, the Montana Nature Conservancy has been impressed with the rapid development and deployment of the sensitive species program in the Northern Region, and is confident that rare species are taken into account in weed control. I would also like to add that we feel the Lolo Forest has a particularly good record for sensitive management decisions, and are confident that this sticky issue will be handled with the same thoughtful care.

Best Regards,

Joan Bird

Joan Bird
Montana Protection Planner

Big Sky Field Office · Power Block West, 3rd Floor · P.O. Box 258 · Helena, MT 59624 · (406) 443-0303 · FAX (406) 443-8311

Forest Service Response
LETTER 3:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: EIS Appendix D includes requirements (under all alternatives) for a biological assessment of threatened, endangered, and sensitive species in each project area.

4

FIVE VALLEYS AUDUBON SOCIETY

P.O. BOX 8425, MISSOULA, MT 59807

Orville L. Daniels
Forest Supervisor
Lolo National Forest

February 24, 1990

Re: Reply to 1950/2200

Dear Mr. Daniels:

Thank you for this opportunity to comment Noxious Weed Management. We encourage use of a plan with minimal pesticide control of existing noxious weeds with an emphases on biological help.

We feel where pesticides are of the greatest advantage is when a new species emerges and there are weeds that can't be controlled by physically pulling them.

A

Again, thank-you and good luck.

Sincerely,

Linda Helding
Conservation Chair

FOREST SERVICE
FEB 26 1990
RECEIVED

Chapter of the NATIONAL AUDUBON SOCIETY

Forest Service Response
LETTER 4:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We've tried to incorporate this philosophy in the Control Priorities discussed in EIS Chapter II.

5

Feb 28,1990

FOREST SERVICE
MAR - 2 1990
RECEIVED

Orville L. Daniels, Forest Supervisor
USDA Lolo National Forest
Building 24, Fort Missoula
Missoula, Montana 59801

Sir:

Comments on draft of "Noxious Weed Management" plan for the Lolo Forest.

I initially had several concerns but as I continued to study the plan most of them were satisfactory addressed. It was difficult to find some things but overall it is a very good document. My initial concerns included definitions of noxious weeds, County cooperation, system of identifying sensitive or endangered plants, and the apparent limitations on the type of herbicides to be considered.

The one specific comment I want to make is on the alternatives. Alternative E is the only choice that gives any progress (7% over 10 years) on the weed problem and should be the alternative selected. I object to the characterization of alterative E as being the "Eradication" choice as suppression of some species is a part of the game plan. Perhaps a real "Eradication" alternative extreme should be developed as a point of reference only.

A

In summary "a plan that shows some improvement is needed as continued deterioration is unaceptable".

Sincerely

Willis J. Heron

Willis J. Heron
2775 Spurgin Road
Missoula, Mont. 59801

Forest Service Response
LETTER 5:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We've clarified the descriptions of Alternative E in the Final EIS. Alternative E is meant to be an aggressive attempt to eradicate ***or suppress*** weeds, tempered by overall costs and expected control success for each of the nine weeds. For example, the sheer magnitude of the spotted knapweed infestation makes eradication in ten years very unlikely. Leafy spurge is such a tenacious plant that anything beyond containment seems improbable with current technology.

We chose to not analyze another alternative more aggressive than E because such an alternative would have prohibitive costs, only marginally improved control, and increased risks of environmental effects. We feel that our original alternatives provide the Forest Supervisor with a reasonable range of choices.

Forest Products
P.O. Box 8
Milltown, Montana 59851
406 258-5511

Champion
Champion International Corporation

6

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
MAR - 2 1990
RECEIVED

Terry Egenhoff
Lolo National Forest
Building 24, Fort Missoula
Missoula, MT 59801

February 27, 1990

Dear Terry:

In regard to your Draft Environmental Impact Statement on noxious weed management that was produced in November, 1989, I'd like to pass on a few comments.

I feel that as a responsible agency, the USFS must look at the problem of noxious weeds using your alternative C: Control weeds that affect national forest resources and adjacent landowners who have active weed management programs. I also feel that this must be tempered with good judgement as far as the feasibility and success of the proposed weed control project. For example, education of knapweed in Missoula County would be highly questionable. A

Thank you for allowing me to comment on the statement.

Very truly yours,

Lorrie Woods

Lorrie Woods
Resource Analyst

mrw/Woods

Forest Service Response
LETTER [redacted]:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: Any public information programs that we engage in would be designed for specific purposes, in cooperation with other agencies or groups. While spotted knapweed in general may be a lost cause in Missoula County, an information campaign could prevent the spread of knapweed into specific areas that are currently weed free. Information programs focussing on less extensive weed species might help prevent other weeds from spreading the way spotted knapweed already has.

Augusta Mont
Mar 3 1990 (7)

LOLO NF
MAR 7 1990
FS, PIO, RES, TECH, PLAN, ADMN, DIST, B&F, PERS, BUSRS, OFFSV, CONTR, CMPTR, AFD
Covault JC

Knapweed Control
Lolo National Forest
Missoula Mont

After the 64 flood The Forest Service seeded grass + clover along The Sun River and several Creeks.

They also rebuilt the road + seeded along The backslopes + borrow pits.

In just a few years The Knapweed patches were apparent and when I asked if I could spray Them The Forest service informed me the public sentiment against spraying would be to strong —

By 1985 it looked unstopable but we had to spray the "withdrawn land" to save The Irrigation project.

By careful and selective spraying we have almost wiped out the Knapweed

The brush + Tree's are still healthy and The public accepted it 99% because of better education methods Nationwide.

The only way to control Knapweed at this time - is Get off your butts and go after it untill its gone -

You may have to go over it several Time's but it can be beat.

Forest Service Response
LETTER 7:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

Don Mergenthal
Gibson Dam
Augusta Mont
59410

For effective spray Formula's contact
Jerry Nypen Project Manager
Greenfield Irrigation Dist.
Fairfield Mont.
59436

FOREST SERVICE
LO... NATIONAL FOREST
... MONTANA
MAR 14 1990
RECEIVED

3-12-90

Forest Supervisor:

Please consider our comments when choosing an alternative on noxious weed management on the Lolo National Forest.

First, let me complement you on finally addressing a pressing problem on the Lolo Forest.

Our first choose would be Alternative E, attempt to eradicate all noxious weeds on the Forest. We realize that finacially + practically speaking this is an extreme alternative which is probably not feasible.

Our second choice is Alternative C, control weeds that affect national Forest resources and adjacent landowners who have active weed management programs coordinated through a county weed board.

I feel special attention should be paid to the Ninemile Ranger Station area since it is surrounded by active weed districts and is a ranching situation where weed control is essential to having a viable operation, + being a "good" neighbor.

A

I would also like special attention paid to weeds besides knapweed; such as new + controlable weeds that are still relatively limited in number of acres such as leafy spurge, starthistle, goat weed + Dalmation toadflax.

The backcountry (Great Burn, proposed Wilderness), also needs special attention along with trailheads. I realize chemicals will have to be used + only request that they be used carefully.

Lets [illegible] the pr[illegible]!

[illegible]

Forest Service Response
LETTER 8:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: The discussion of Control Priorities in EIS Chapter II includes concern for backcountry, administrative pastures, and newer, less extensive weed species as the highest-priority situations for weed control.

Sincerely,
Dean and Kathy Solheim
Star Route, Box 595
Huson, Mt.
59846

RC'D 3/14 3/13/90 9

Bob

It was really good news to learn that the Lolo has prepared a Draft EIS on Noxious Weed Mgmt. In my judgement it is an excellent document & reflects a great deal of study and exploration of the available literature. It will be a valuable source of information as the Forest continues with the selection of a preferred alternative & refine the Land & Resource Mgmt Plan.

Following are a few thoughts that came to mind as I reviewed the draft material:

1. Regardless of the advance [illegible] done in [illegible] of an herbicide

Forest Service Response
LETTER 9:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: All action alternatives include a Biological Program to support non-chemical weed control research (see FEIS Chapter II, description and comparison of alternatives). The type of research you mention is in fact ongoing through several agencies such as USDA Agricultural Research Service, USDA Animal and Plant Health Inspection Service, Montana State University, and the University of Montana, to name just a few. As part of the National Forest System, the Lolo National Forest is not authorized to conduct research itself, but we can cooperate with these other agencies in a variety of ways.

B: The goatweed beetle is most effective in Mediterranean climates. Our colder winters may be limiting the beetle's effectiveness here. Losensky's 1987 paper (see References section of the EIS) noted studies that have found these beetles avoid or are unsuccessful on certain kinds of sites that are common here (e.g., shady, steep south-facing, eroded, or near ant nests). Losensky (1987) also discussed other biological agents that are under study for goatweed control.

(2)

proposal, it is often a very emotional subject. Regardless of its merits, there is no way to be sure of support - its a controversial subject. Being objective and professional, however, is all important.

2. Alternatives A, D, & E are hardly acceptable options on a Forest wide basis. Any one of those three alternatives might be used on a limited scale under special situations; however, none of them would fit a large acreage. For example, herbicides could not be used in a wilderness - thus, A + D are out. E is hardly practicable except in special cases. From a realistic point of view, the budgetary situation will also tend to eliminate option E. If only one strategy can be chosen, it

(3)

seems to boil down to B or C. Since C includes N. 7 as well as adjacent private lands, I would feel obligated to go with Option C.

3. The noxious weeds we're dealing with have been introduced from somewhere else in the world. Our efforts to learn about biological controls should therefore be concentrated in the areas from which these troublesome exotics came. I understand that work of this nature is on going to some extent, but it needs to be emphasized. In fact, research programs on biological controls need much greater attention.

A

(4)

4. I was surprised to learn that goatweed is such a problem. More than 35 years ago, goatweed beetles were introduced in N.E. Wash; No. Idaho, & Northwestern Montana. Many colonies of these beetles were planted in the 1950's and I believe goatweed infestations were greatly reduced. Apparently that situation has changed - it would be interesting to learn more about the problem.

B

To summarize, it's my thinking that an effort to get on top of the weed problem is over due - and that those involved are to

(5)

be commended. The next few years promise to be interesting, assuming you get adequate funding to make something happen.

Thanks for the opportunity to review the Draft EIS.

Bill Fallis
Sorrel Springs
Frenchtown MT. 59834

FOREST SERVICE
LOLO NATIONAL FOREST
MAR 16 1990
RECEIVED

Huson, Montana
15 March 1990

ORVILLE L. DANIELS
Forest Supervisor
LOLO National Forest
Missoula, MT 59801

Dear Sir:

I am glad the draft EIS concerning Noxious Weed Management has finally been published and that I am able to comment on it. The proliferation of weeds on the forest, especially the Nine Mile District has been a concern of mine for a number of years. On November 7, 1982, in commenting on a grazing plan published by the District, I had this to say about the weed situation.

"The second area of concern is noxious weed control. Much of the valley is already overrun with spotted knapweed and daisy. There are also localized patches of Canadian thistle where the ground has been disturbed. A relative newcomer to the area, which I see as a great of a threat as knapweed is Tansy. I have found clumps of this weed on three locations on Kennedy Creek; along Nine Mile Road above Soldier Creek; on the Westside Road between the first switchback and Monture Creek; and along the first quarter mile of Head of Fire Creek Road. I also have several patches at home which I have tried without success to eradicate with 2-4D. Next year I intend to try Roundup or Tordon. I recommend a joint effort to eliminate this weed with the Forest Service providing the chemical and the sprayer and the 9 Mile Stock Association providing the operators and assistance in locating the weeds."

Needless to say my recommendation was not acted upon and the weeds have continued to spread. The time for action is now and I hope you will select Alternative C as the forest plan. This alternative not only allows you to work with cooperating, adjacent landowners but gives you the flexibility to treat weed infestations occurring in other parts of the forest. Infestations that if left unchecked provide reservoirs of seed to reinfect areas already treated.

The many miles of logging roads in the district that have been seeded to grass provide excellent grazing not only for cattle but for deer and elk. Unfortunately many roads are now infested with knapweed and tansy, with the grass being crowded out. In spite of the comment in the plan that knapweed provides winter forage for game I have seen very little of this use. Elk will paw through the snow to graze the grass under it while ignoring nearby knapweed that is sticking through the snow. I have never observed any

Forest Service Response
LETTER 10:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Please keep in touch with the Ninemile District Ranger for issues in your area.

grazing, winter or summer of tansy. Since most of these roads are not located adjacent to private landowners, selection of Alternate C would allow you to treat these important sites. Also the very nature of these sites allows them to be easily treated with motorized spray equipment.

I recently read that USFS Chief Robertson has decreed that "Stewardship of the Land" is the first priority of the forest supervisors. The unchecked proliferation of weeds is certainly not an indicator of good stewardship. The options available to you under Alternative C provide the means for environmentally sound, physical improvements to the land that will ultimately benefit all users of the forest. While there will always be some detractors, I think it will have a positive effect on the image of the Forest service.

Sincerely yours,

ROBERT W. DEMIN

11

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
MAR 16 1990
RECEIVED

NINE MILE LIVESTOCK ASSOCIATION
2010 NINE MILE ROAD
HUSON, MT 59846
14 MARCH 1990

ORVILLE L. DANIELS
FOREST SUPERVISOR
LOLO NATIONAL FOREST
Building 24, Fort Missoula
Missoula, MT 59801

Draft EIS, Noxious Weed Management

Dear Sir:

The following comments concerning the draft EIS, Noxious Weed Management are submitted on behalf of the Nine Mile Livestock Association.

At first glance it would seem that Alternate E, attempt to eliminate all noxious weeds on the forest, would be the logical choice. It is recognized however that this alternative is impossible to achieve..physically, fiscally, chemically or biologically.

The choice preferred by the Association is Alternate C, control weeds that affect national forest resources and adjacent landowners who have active weed management programs coordinated through a county weed board. We recognize that any control program has to be a joint effort. An individual landowner, group of landowners or the FS going it alone is a futile effort and would be a waste of resources. Alternate B, while a viable option, severely limits your actions as to where weed control can take place. Nonadjacent infestations left untreated can serve as seed sources for reinfection of treated areas by other forest users, i.e.. loggers, hunters, and graziers.

The benefits to range and wildlife obtained by treating nonadjacent sites are not fully addressed in the draft EIS. While dead, dried knapweed is mentioned as a winter forage for big game it is definitely not the food of choice. On sites where there is grass mixed with the knapweed, elk will paw through the snow to get at the grass and leave the knapweed. The same can be said for summer range. Knapweed is seldom grazed unless there is no other choice, even when the plants are young and tender. Tansy and goatweed don't appear to be eaten at any time.

A

As you are aware, much of the Nine Mile has been roaded due to logging activities and the roads have been seeded with

Forest Service Response
LETTER 11:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We've tried to estimate the weed control benefits to range and wildlife as best we could give the current state of knowledge. The EIS recognizes weeds are not preferred forage for wildlife or livestock. It is simply unclear whether or to what extent increases in weed infestations would increase wildlife use of ranchers' hay meadows. It is arguable that wildlife are drawn to alfalfa and irrigated hay because those crops are more palatable than even the natural, weed-free forage on dry upland sites. Since our worst-case scenario calculates a winter range forage loss of 18% due to weeds, the presence of weeds may not severely aggravate wildlife depredation on private land. That is not to infer that big game can't cause major losses to these private crops. We need better data with which to evaluate this issue. This research need has been discussed with the Montana Department of Fish, Wildlife, and Parks, and with researchers at the University of Montana.

B: We recognize that weeds affect all resource areas, not just range, and that control costs should be shared by all functions that contribute to weed problems or benefit from weed control. Appendix D of the EIS includes over 30 weed prevention measures that will apply to the full range of forest management activities.

grass when logging is completed. These roads are an important component of range forage production, for both cattle and wildlife. Unfortunately in too many instances weeds have crowded out the grasses and forage production has been severely curtailed. As previously mentioned roads left untreated serve as a reservoir of seed easily transported to infect or reinfect weed free sites. Access to these roads makes them fairly easy to treat with motorized spray equipment. Most of these roads are not located adjacent to private landowners and therefore would not be treated under alternative B.

Selection of Alternative C would also give you support from a wider cross section of forest user--the recreationist, whether he be hunter, viewer, or photographer. As the deer and elk are drawn to the cultivated meadows on the valley floor to forage, the recreationist is drawn to the valley to "do his thing." It stands to reason that if the forage on the back country roads is improved, the opportunities for the recreationist will also improve. It would be a remission not to point out that increased forage in the back country may also relieve some of the pressure on the ranchers hay meadows.

A

We recognize that the range budget and range income on the Lolo are very limited and the money available from there would not cover control costs under Alternative C. Weed control is more than just a range/livestock/landowner problem. Other forest users such as loggers, woodcutters and recreationists contribute to the spread of weeds. We recommend that money from these accounts be budgeted for weed control activities including spraying and seeding or reseeding controlled areas or newly disturbed areas.

B

In recent weeks there has been considerable publicity about USFS Chief Robertson's new directive that "Stewardship of the Land" is now the first priority. It would seem to us that the unchecked proliferation of weeds as has occurred in the past is not good "stewardship." Your actions taken under Alternative C will not only benefit the land but also a broad spectrum of the using public.

RICHARD G. RAMBERG
President

ROBERT W. DEMIN
Secretary/Treasurer

JOHN R. SWANSON
3400 Edmund Blvd.
Minneapolis, MN 55406

March 12, 1990

Lolo National Forest
Building 24
Fort Missoula
Missoula, Montana 59801

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA MONTANA
MAR 19 1990
RECEIVED

Dear Sirs,

Please accept my Comments concerning the Noxious Weed Management Draft Environmental Impact Statement Amendment Lolo National Forest Plan.

I am acquainted with the Lolo National Forest, and continue to agree that the National Forest contains outstanding wilderness, wild-life - biological, cultural and scenic resources of certain national significance.

I, then, strongly recommend that in order to properly manage the unique, varied and often fragile natural attributes found on the Lolo National Forest, the physical - manual control method(s) must be fully adopted concerning Noxious weed management.

Sincerely,

John R. Swanson

Forest Service Response
LETTER 12:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision.

MAR 19 1990
RECEIVED

March 15-1990

13

Dear terry:

First – thank you for the opportunity to voice my concerns about developing policy on a special aspect of vegetation management.

Second – Congratulations on a professionally well written DEIS

third – the ecolog of noxious weeds on agricultural lands has been researched to a certain degree, and results have been adequately reported. The ecology of noxious weeds in a long-term vegetation complex has yet to be properly studied, especially with regard to natural resource public lands under your administration. On these lands, change is expected to occur, even built into management activities, and the resources are multi-fasceted naturally and politically making the future necessarily difficult to predict and plan for.

Specifically — The ecological effects of native and exotic, plants and insects has not been adequately researched can native beneficial insects (parasites, predators, scavengers, pollinators, etc.) adapt to replacement plant species, especially exotics introduced accidently or intentionally! How will native harmful plants and insects respond to biological control agent introduction and establishment! or to the removal of essential habitat of beneficial insect species due to weed invasion, chemical applications, biological control agents, and natural succession? In short — the ecology of noxious weeds on forest and range lands is complex and filled with uncertainties. How A long can a long-term natural resource public agency deny acknowledging potential consequences of vegetation management strategy? If a use can be found for a B noxious weed, will biological control agents become chronic pests? C

Lastly — As international development proceeds, we can expect additional exotic plant species to become established on agriculture and natural resource lands. Unfortunately, policy has already labeled these exotic plant species noxious. Can't we consider finding a use for some of these plant species? either for here or someplace else? D I look forward to participating in public debate on this sensitive issue. Sincerely,

Charles F. Tiernan

Forest Service Response
LETTER 13:

A: We agree that additional information is needed to fully understand vegetation dynamics as they relate to the introduction of exotics. However, we do have ecological models for these changes which can be used to predict potential change. The USDA Animal and Plant Health Inspection Service has been searching for and studying native biotic control agents that are found on noxious weeds to see if adaptation to these species is occurring. The development of a native rust on Canada thistle is currently under study as a result of this effort.

B: As a part of the analysis of ecological integrity in this EIS, an attempt was made to evaluate the impacts of management activities on vegetative structure. We recognize that our management activities can change the vegetative structure by both excluding natural processes (fire) and by planned and unplanned species introductions. While we may not understand the full consequences of our actions on long-term vegetative change, we do accept that our management strategy can have a major impact on vegetative structure. Our goal as stated in the Lolo Forest Plan is to "provide a pleasing and healthy environment, including clean air, clean water, and diverse ecosystems."

C: The intent of our vegetative management strategy is to maintain the natural vegetative structure of the native plant community and not introduce exotic vegetation. To accomplish this requires that we accept both beneficial native insects as well as native species which we may think of as undesirable. As exotic plants become introduced into our natural systems it becomes critical that their natural controls also be introduced at the same time, to maintain a balance. Future unforeseeable uses of noxious weeds may change the importance of a plant, but in the meantime, introduction of control agents will maintain a semblance of balance in our systems so that we can maintain a more natural vegetative system in balance with its environment.

D: Uses have been identified for a number of noxious weeds. For example spotted knapweed provides a source of high-grade honey in the Bitterroot Valley, while leafy spurge provides forage for sheep and goats in eastern Montana. However, a monoculture of these species results in major losses of food and cover for a multitude of other species. Once a noxious weed is established it is almost impossible to eradicate, so a strategy of containment can provide for continued diversity in our plant communities. The vegetative structure of a diverse plant community will be more stable and provide food or shelter for a wider variety of species.

14

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
MAR 26 1990
RECEIVED

March 20, 1990

To: Orville Daniels

From: Max Kummerow

Re: Comments on Noxious Weed Management Draft EIS

I. Minimize costs and impacts by timely action to reduce spread of weeds.

In most cases where impacts are being assessed, the "no action" alternative has least environmental impact. In the case of weed control the opposite is true. "No action" has already produced enormous environmental and economic losses in western Montana, with four million acres affected by knapweed alone and economic losses many millions of dollars annually. The Lolo Forest may suffer even greater losses in the future as weeds move into pristine Wilderness areas, clearcuts, and wildlife winter range.

Risk of negative impacts from weed control activities are almost certainly outweighed by negative impacts of no action or delay. Action now may forstall the need for larger scale anti-weed efforts later and thereby minimize impacts of both weeds and weed control efforts.

II. Benefit/cost issues.

Optimum funding level for weed control measures depends on the future economic costs of weeds. The most serious deficiencies of the draft EIS are omission of significant categories of economic impacts due to weed infestations as well as possible underestimates of costs that are mentioned. This results in significant understatement of the benefits of weed control and the justifiable weed control budget.

Under worst case assumptions, weeds may cause reductions in timber regeneration, loss of livestock grazing, loss of wildlife winter range, loss of recreational opportunities, aesthetic losses, and loss of native plant and wildlife communities across a wide range of elevation, soil, and moisture conditions. Spending more than any of the alternatives identified in the draft EIS could be justified in a worst case scenario. A

So far, the majority of economic losses from weeds have probably been to private livestock raisers on private lands. In the future, as weeds spread to more remote locations, loss of wildlife habitat and effects on timber stand regeneration may become more widespread. These losses will be suffered mostly by outfitters, the local economy dependent on spending by sportsmen, private recreationists, and the timber industry.

Losses of grazing for private stock users, Forest Service stock, and outfitters is not mentioned in the draft EIS. Outfitters, in B

Forest Service Response
LETTER 14:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We consciously chose not to attempt a comprehensive economic analysis in this EIS. With the exception of timber regeneration (see comment E below), you are probably correct in the potential economic effects that you identify here. However, we simply have no way to quantify those effects, nor to determine what role weeds on the Lolo National Forest may play in the larger context of western Montana. Our strategy for economic analysis was to limit our discussion to those resources for which we have a basis for quantification. We felt comfortable doing that with only two resources: 1) livestock forage, and 2) big game winter range. Even those two areas are fraught with uncertainties, so much so that the resulting numbers should only be used for general comparison between the alternatives, not in any attempt to derive absolute dollar values for economic effects of weeds or weed control. We do not have the information nor knowledge to go beyond that rudimentary level of economic analysis.

In this EIS we have attempted to display those costs and benefits which can be quantified. This in no way is meant to imply that these are the only costs and benefits of importance. The Forest Supervisor will consider non-market and subjective issues as well as quantified economic information when he makes his decision.

B: Back-country and Wilderness stock users would be affected by reductions in forage associated with weed invasions, just as livestock and big game winter range would be affected. The FEIS includes Management Requirements in Appendix D aimed at reducing the spread of weeds into these areas. The Control Priorities section of Chapter II has been revised in the FEIS to make weed prevention and control in theses areas the highest priority for project development.

C: As discussed in the Wildlife Section of Chapter IV, there are many unknowns in calculating the effects of weeds on elk populations. The estimated "worst case scenario" (calculations are shown in Appendix H-21 and 22) shows a net loss of 18% of the Lolo's wintering elk population over a 50 year period. This represents over 2000 elk, which would have a huge economic effect on Montana. Because of the long-term uncertainties of how knapweed and other weeds will respond to biological controls, or even the possibility that ungulates will slowly adapt to weeds in their diet, the Lolo elected to limit elk-related impacts to a 10-year period

particular, rely heavily on forage available in Wilderness and roadless areas. Their operations would be greatly affected by a need to pack in more feed. Weeds have now advanced up roads to most trailheads and isolated patches are showing up many miles inside wilderness areas. If these invasions aren't controlled, a major change in the character of wilderness areas, their ability to support recreation relying on stock use, and perhaps their ability to support endangered species could be lost in the long run.

B

Potential losses of elk winter range may be more significant than indicated in the draft EIS, which admits to uncertainty, but then chooses a low figure for potential losses. If considerable loss of elk carrying capacity were to result from further spread of weeds, economic losses to the region would be considerable. Ed Wolfe, author of a book on elk hunting and several elk hunting videos, points out that out-of-state hunters pay $450 for a license and an average of about $2000 to outfitters. Since only about one out of six fills a tag, each harvestable elk leads to spending of roughly $15,000, plus any multiplier effect an economist would choose to add. A significant reduction in elk numbers would entail an economic loss in the tens of millions of dollars annually to western Montana.

The draft's rationalization that if weeds infest parts of winter range, elk could move to unaffected forage is not convincing. If correct, it means the area could support more elk now and will eventually, with good management do so, making preservation of elk range even more important to the local economy. And why won't other forage areas also eventually be affected by weeds? Even if the problem becomes acute for only a few weeks each year, that may be enough to kill wildlife.

C

Future rates of weed spread appear to be projected at a considerably slower rate than occurred in the past. What does this say? Perhaps it means that with 225,000 acres infested the Lolo Forest has already failed to control weeds and the battle is lost (that is, weeds already infest almost every place in the Forest that isn't rock, ice, or shaded) so future spread potential is limited. Or, perhaps optimistic low projections of weed spread are being made that aren't consistent with past experience. A third point of view is that growth in acreage affected may slow down because most sunny soil is already growing weeds, but that remaining infestations will have bigger than proportional impacts on wildlife, grazing, and backcountry recreation because the few patches of grass left are important for wildlife and stock.

D

A question not addressed by the EIS is whether the fact that exotic weeds are more efficient competitors than native plants means weed infestations reduce timber regeneration. If so, a very significant economic impact has been omitted from the analysis. As weeds become more widespread and timber harvest occurs in more heavily roaded (eg weeded) areas, weed competition

E

which shows a much reduced "worst case" effect. This wasn't done to downplay the potential effects. We simply wanted to limit our quantified analysis to a period within which we some confidence in our predictions.

The concept of elk mobility on the winter range is not well documented in the EIS. Mobility was one of the key elements in determining knapweed/elk effects. Mike Thompson, biologist and manager of the Blackfoot Clearwater Wildlife Management Area, was consulted at length over the mobility question and provided much of the background information discussed in Chapter IV. The conclusion regarding mobility, based on numerous elk winter range and elk movement studies, is that elk are often highly mobile and unpredictable in their use of certain winter range areas. Additionally, it was felt by numerous biologists consulted that it is generally impossible to achieve uniform maximum forage utilization over the entire range based on such unpredictable movement. Thus, in order to avoid overutilization in some areas which would be damaging to the resource, elk carrying capacity is generally established at a point that is less than maximum utilization over the total winter range.

D: In general the spread of spotted knapweed may be at a lower rate than in the past because the most favorable sites have been infested. This does not mean however that many favorable sites are not available. A 3 percent growth rate in the next 10-year period represents an increase of about 7,000 acres which is a considerable acreage compared to the area covered by all other noxious weeds. All other species with the exception of musk thistle show a high rate of spread because of the availability of suitable acres and the exponential growth of a newly established species. In addition the density of the infested stands will increase crowding out the native vegetation.

E: The effects of weeds on timber regeneration are discussed in the Timber section of Chapter IV. This a question we have attempted to answer in our evaluation of the weed problem. Unfortunately we could not find data that would support either contention. We do have many examples of young pine plantations that are saturated with spotted knapweed where tree survival is excellent. At the same time plantation failures are not necessarily occupied by noxious weeds. At the present time it does not appear that the presence of noxious weeds is any more of a threat to tree survival than native plants that would otherwise be competing with tree seedlings.

F: Absent documentation that weeds *do* affect purchase decisions and actual sale prices, we cannot quantify the effect of weeds on land value. Once again, simply because we do not quantify costs associated with weeds does not mean that we don't recognize that

with young trees will become more common.

1E

As the draft points out, aesthetic and land value considerations depend on one's preferences. To me, (biases absorbed from ranching relatives) a native bunchgrass community is beautiful and a weed community is ugly. Because natural beauty and wildlife are so important in western Montana, aesthetic impacts of weeds may be much more important than the DEIS implies. For example, native wildflowers are aesthetically valued by many Montanans and tourists.

Dismissing weed effects on land values because highest and best use is not agricultural is an error, absent documentation that buyers do not consider weeds in their purchase decisions. Although the typical buyer of a Missoula County ranch or ranchette may not make their living from agriculture and pays more than is justified by ag income, they do graze horses and psychologically think of themselves as owners of productive rural property. Most buyers are willing to pay more for weed free land and most acreage is used for stock grazing or would be if weeds hadn't destroyed forage. Aesthetic considerations are probably not negligible in their impact on land values. For some reason those people the draft EIS says don't consider ag value or weeds pay several hundred dollars per acre more for irrigated weed free land in the Bitterroot valley than for dry knapweed covered benchlands a mile or two away. Aggregate land value losses due to capitalized value of lost grazing alone is probably substantial.

F

In addition to impacts on the Lolo Forest itself, the analysis should take account of the fact that the weed infested lands in the Lolo are a source of weed infestation in other parts of Montana and several surrounding states. The costs of allowing weeds to proliferate are born partly by surrounding lands, which is the basis of public weed control statutes. Costs to other lands were not quantified in the draft EIS.

G

As a public agency the Forest Service should concern itself with overall social costs and therefore include all losses attributable to weeds in its calculations. If adjacent private owners begin to control weeds, then suffer reinfestation due to Forest Service land management, private owners might seek damages that would force the FS to internalize some of these private costs.

Adding all future potential public and private costs of weeds to the benefit/cost calculation, a much higher level of weed control spending is justified than indicated by the draft's analysis.

A

III. Chemical v biological weed control

Questions like "chemical v biological controls" are too simplistic. As with fire control policies, the more we find out the more the answer becomes "it depends." The hills around

such costs may very well exist. The discussion of land values in Chapter IV recognizes that land used for agricultural purposes (including stock grazing) could be damaged to the full cost to cure the weed problem. However, rural residential, recreational, and timberland market values are quite high independent of any forage values.

G: As explained above, we did not feel that we could even begin to quantify all costs associated with weeds in western Montana. However, the EIS does recognize that weeds on national forest lands can have serious effects on adjacent landowners. This issue was so important to us, we developed a "minimum action" alternative with the primary objective of cooperating with the weed control efforts of adjacent landowners.

H: We agree with the logic of the "perimeter strategy" you describe. We tried to use similar logic when we developed the species-specific control objectives for each alternative. We also use this logic to develop the general control priorities discussed in Chapter II.

I: Each alternative includes an "information" element to include the kinds of education you mention.

J: We will explore ways to stimulate the production and use of weed-free feeds for stock users in Wilderness and backcountry. We've included a management requirement to that end in Appendix D, and the Control Priorities section of FEIS Chapter II includes an expanded discussion of this issue. We'll also explore ways to incorporate weed prevention and control in outfitter and permittee activities.

K: Controlling resource damage is already a factor that is included in making road closure decisions, but the management requirements in Appendix D have been reworded to make this explicit. Travel access is a volatile issue on this forest, and weed control can only be one of a multitude of factors that must be considered when deciding whether or not to close a road. Thoughtful analysis of road location (including whether to build a road at all), design, construction practices, and maintenance are all factors that are probably much more important to weed control than closure of a road already on the ground.

L: All action alternatives include a "biological program" element to foster research in biological weed control. We have no authority to conduct direct research ourselves, but we can an do cooperate with other agencies in their research efforts.

M: The Forest Supervisor can modify alternatives as you suggest when he makes his decision.

Missoula, and most of the non-irrigated lands in the Bitterroot valley have lost a majority of their grazing potential to knapweed, leafy spurge, etc. The cost of spraying this much acreage would be prohibitive, results mediocre (due to reserves of seed in the soil), and environmental risks from large amounts of herbicide considerable.

By contrast, logging roads leading up to trailheads and isolated patches of weeds within wilderness areas would cost much less to spray, pose fewer risks, and give greater benefits per acre sprayed. Since the acreage involved would be small, the risk of contamination to streams, loss of native plants, etc. would be much smaller than in the case of area wide spraying. In these situations, it would be more difficult for biological controls to become established (because the weeds are in small strips or patches). And since biological controls don't result in a 100% kill even under the best of circumstances, the further spread of weeds into Wilderness, winter range, and regenerating clearcuts will never be prevented solely by biological means.

A "perimeter strategy" makes sense based on the reproductive habits of knapweed, most of whose seeds fall within a meter of the parent plant. In addition, some weeds, especially leafy spurge are very difficult to eradicate once established, so the best strategy is to keep them out in the first place. A perimeter strategy would mean concentrating efforts on keeping weeds out of weed free areas by means of spraying roadsides and isolated patches, trying for 100% kill. In such areas, spraying one acre may prevent infestation of hundreds of acres that experience suggests might eventually be lost to weeds, so economic benefits of spraying can be quite high relative to costs.

H

For example, a couple of years ago, a small patch of knapweed appeared along the road leading into the Boyd ranch. That pioneer weed patch was surrounded by several thousand acres of relatively weed free grass. It would have been much cheaper to prevent the small patch from spreading and repeat a spot treatment as needed, than to eradicate weeds from the whole area a few years later. (I'm told weeds are now widespread on the game range.) Another example: In recent years, knapweed has greatly increased on the Lodgepole Creek road near Monture creek. The obvious worry is that seeds will continue over into the Bob Marshall as well as spreading from roadsides into nearby clearcuts. It is my impression that weeds are now poised and ready to do their worst damage to winter range and backcountry forage because they have now spread to trailheads and road ends and because there are now so many sources of seed.

Using a spot and roadside spraying strategy will result in less environmental impact than not spraying. A preventative approach with use of chemicals offers less environmental danger than doing nothing, which has to led to widespread losses of native plant communities and wildlife reliant on native plants.

H

On the other hand, large areas heavily infested with weeds are ideal habitat for biological controls. In such areas, spraying does not protect surrounding (already infested) areas, and it is likely that the area will soon be reseeded from surrounding unsprayed weeds or seeds that have accumulated from previous years. So the cost effectiveness of spraying varies by several orders of magnitude depending on circumstances.

It should be pointed out that biological methods are probably as environmnetally risky as chemical methods. Experience with exotic species used for pest control has been mixed to say the least. Major long term environmental problems have sometimes resulted where biological controls were introduced. So it is quite important to put sufficient resources into research on biological controls. Even with proper research, it is impossible to be absolutely certain that a biological control agent won't attack beneficial plants. Imagine an organism that after killing knapweed switches to living on douglas fir or alfalfa.

Despite the risks of control measures, the losses sustained from weeds justify spending for a balanced, well researched, multi-method, and carefully monitored weed control effort. The Forest Service should not be afraid to spray to maintain a perimeter around weed infestations, nor to carefully introduce biological controls, but should avoid massive, costly chemical control where weeds have already become widespread and overly hasty or poorly researched biological measures. Small scale chemical efforts to reduce the spread of weeds are already a decade or more late and should be implemented as quickly as possible.

IV. Other weed control measures

Part of the weed control budget should go for education of Forest Service staff, outfitters, recreationists, and the public on weed control. Probably the most cost effective way to keep weeds out of the Wilderness areas and wildlife winter ranges would be to enlist the support of outfitters and recreationists. If thes groups knew how to identify weeds and were motivated to eradicate small patches when they first appear, weeds could be kept out of uninfested areas. I

Outfitters should be equipped with small hand spraying apparatus and required to spray when they encounter patches too large to pull by hand. Outfitters have a big economic incentive to control weeds since they rely on backcountry forage for their stock. Spraying a few acres a year beats possibly losing most of the forage in the Bob Marshall. Most recreationists would be willing to help preserve the plant communities they enjoy. J

Weed free feed for stock should be researched and if feasible, and if other means of control don't prove effective, weed free feed requirements should be phased in gradually as part of an overall strategy of integrated weed control. Perhaps the most

important considerations are to provide economic incentives for feed producers to control weeds and to stock users to use it, without putting undue burdens on any group. Perhaps extra costs of weed free feed could be returned to outfitters by contracting with them to control weeds in the backcountry. Perhaps fees should be higher on those who don't use weed free feed or whose camps and trails show w~~f~~eed infestations. J

It is surprising that road closures were not mentioned in the Appendix D mitigation measures. Closing roads costs very little (in fact, reduces road maintenance costs), yet would probably be one of the most effective means of slowing the spread of weeds into unaffected areas. Combining road closures with roadside and spot spraying as needed would probably be even more effective. There are probably cases where weed control considerations would tip the balance in a decision towards leaving an area roadless. For example, roads into areas with abundant wildlife feed. K

The Lolo Forest, as one of the areas most affected by weeds, should lobby within the Forest Service and in cooperation with other federal, state, university, and local agencies to allocate more funding to research and cooperative control efforts to develop biological controls. The Lolo Forest needs help from state and federal agencies who should take the lead in weed research. L

Even keeping weeds at near their present acreages will require a much increased weed control budget and a variety of management actions designed to contain weeds.

V. Comment on alternatives

Achieving a balanced approach might best be achieved by something close to adding alternatives C and D, eg. do both C and D. This would put total expenditure at about $640.000 or around 4.3% of the current Forest budget. Surely with 225.000 acres already infested by a single weed and the past history of weed spread as a warning, 4.3% is not toc much to spend on weed control. Timber regeneration considerations alone might more than justify that amount.

Even adding C and D, the totals are rather modest: M

Information program	$4.000
Inventory	17.500
Biological program (from p. s-20 of DEIS)	35.000

Acreage (adding C+D)

physical treatments	895 acres
biological treatments	1440 "
chemical treatments	2740 "
Total	5075 "

(from p. s-21 of DEIS)

Wouldn't a private owner with 225,000 acres of weeds be likely to allocate at least 4.3% of his effort to controlling weeds on 5075 acres? Given the extent of the problem and future potential for weed damage, this is a modest, reasonable level of effort. Combining C and D would allow more flexibility and balance. In areas such as campgrounds or near water supplies where there was concern about spraying, this combined approach would allow for other control methods to be used and thereby minimize controversy. Yet it would provide a large enough roadside spraying effort to have a significant impact on the spread of weeds. Adding C to D is probably the minimim needed for a serious attempt to contain weeds to their present perimeters. M1

No effort that does not include spraying trailheads and small pioneer infestations in backcountry areas will be effective in preventing the spread of weeds into pristine areas. A combination of approaches will be more effective than any single approach.

Max Kummer
509 Daly
Missoula, MT 59801
549 7149

15

United States Department of Agriculture | Agricultural Research Service | National Program Staff | Beltsville, Maryland 20705

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
MAR 30 1990
RECEIVED

March 27, 1990

Mr. Terry Egenhoff
Lolo National Forest
Bldg. 24 Fort Missoula
Missoula, Montana 59801

Dear Mr. Egenhoff:

I recently received a copy of your draft of the Environmental Impact Statement (EIS) concerning noxious weed management for the Lolo National Forest. I found it to be an excellent EIS with a lot of very useful data. I would suggest that you contact Dr. Chuck Quimby at our Bozeman, Montana, laboratory concerning biological control of a number of the weeds that you have listed in your EIS. Dr. Quimby can bring you up to date on the latest research concerning biological control of many of these weeds.

Dr. P. C. Quimby
USDA/ARS/Rangeland Weeds Lab.
Montana State University
Culbertson Hall
Bozeman, MT 59717-001
Telephone: 406-994-4890

If possible, I would like to receive an additional copy of your EIS. Please send it to the address list below:

Dr. A. Lawrence Christy
USDA/ARS/NPS/Weed Science
Room 237, Bldg. 005, BARC-West
Beltsville, MD 20705

Thank you for your consideration.

Sincerely,

A. Lawrence Christy

A. LAWRENCE CHRISTY
National Program Leader
Weed Science and Agricultural
Chemicals Technology

ars Agricultural Research Service

Forest Service Response
LETTER 15:

Thank you for taking the time to comment on the DEIS. Dr. Quimby was mailed a copy of the DEIS for review and comment.

16

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR - 2 1990
RECEIVED

Mar. 31, 1990

Mr. Terry Egenhoff
Lolo National Forest
Building 24, Ft. Missoula
Missoula, Montana 59801

Dear Terry,

I apologize that this letter will arrive on April 2, 1990, and not by Mar. 31, 1990. The intense debate in our club concerning the DEIS of the Lolo National Forest Noxious Weed Management resulted in a late decision and another obligation kept me from getting this in the mail by midnight Mar. 31, 1990. I hope you will accept our input.

The Backcountry Horsemen of Missoula go on record as supporting Alternative C of the DEIS. However, our club would like to emphasize the use of biological controls in that alternative. We see an opportunity to use all possible control items, each appropriately used in combatting noxious weeds in different forest settings. However, a recent lecture and discussion with Jim Story, the senior research entomologist at the Western Montana Agriculutural Research Center, encouraged us to ask you to emphasize biological controls under Alternative C.

We appreciate the opportunity to introduce our comments, and we will be most willing to work with the U.S. Forest Service in this matter in the future.

Sincerely,

Willis Curdy

Willis Curdy, BCH-Missoula Issues Chair.

Forest Service Response
LETTER 16:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision.

17

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL AFFAIRS
DENVER FEDERAL CENTER, BUILDING 56, ROOM 1018
P.O. BOX 25007 (D-108)
DENVER, COLORADO 80225-0007

April 6, 1990

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR 10 1990
RECEIVED

ER 90/151

Orville L. Daniels
Forest Supervisor
Lolo National Forest
Building 24, Fort Missoula
Missoula, Montana 59801

Dear Mr. Daniels:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) for Noxious Weed Management, Lolo National Forest, Montana, and offers the following comments.

National Natural Landmarks

There are four proposed National Natural Landmarks (NNL) within the Lolo National Forest. They are Alberton Gorge, Carlton Ridge, Snowbird Mine, and Upper Rattlesnake Basin. Brief descriptive materials for each proposed NNL are enclosed.

Status as a proposed NNL is granted only to sites containing one or more ecological or geological feature(s) characteristic of a particular natural region, and determined to be of a national significance. The impacts, if any, of the noxious weed management program on these NNL's should be discussed in the final environmental impact statement, and considered in any future implementation plans. A

Sincerely,

Robert F. Stewart

Robert F. Stewart
Regional Environmental Officer

Enclosure

FOREST SERVICE
APR - 9 1990
RECEIVED

Forest Service Response
LETTER 17:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We can see no weed or weed control effects on these proposed National Natural Landmarks, beyond those already discussed in the EIS. Your enclosed information has been passed on to the appropriate ranger districts for their consideration in project implementation.

15

APR 10 1990

RECEIVED

April 9, 1990

Orville L Daniels
Forest Supervisor, USDA
Building 24
Ft Missoula, MT 59801

Dear Mr. Daniels:

Let me express my sincere appreciation to you for taking the initiative and going forward with the weed management plan. You have a difficult job in balancing all of the viewpoints pushed by the various groups and individuals. I certainly appreciate the opportunity to present a few suggestions and/or ask some questions as follows:

The weed control program must be as flexible as possible, something akin to a mix of alternatives C & E. Of course, we know that total, or even near total, eradication of all noxious weeds on the National Forest and our private land is impossible. However, I believe that it's realistic to strive for 90% to 95% control and continued maintenance near those levels through chemical means until research shows us the way of workable biological controls. I disagree with the 1998 projections for knapweed, considering the various alternatives. It seems to indicate a bias on the part of the author. Tordon carefully applied should do much better than that. You are welcome to inspect my ranch adjacent to the Plains Forest Service office. We sprayed in 1985, obtaining close to 100% control for the first two or three years where the chemical hit the ground. The application left numerous stripes where he missed, which are a monoculture of knapweed. A Another problem causing reinfestation is that my neighbors on the south, the "Forest Service horse pasture", and on the north, the Helterline Estate, have not practiced any weed control measures, both of which have near monoculture knapweed. The Forest Service pasture, ten to fifteen years ago, was a beautiful stand of grass serving as an example of good range management to everyone. Unfortunately, no weed control and year-round grazing of the horses has severely damaged the grass stand. B

Chemical application policies which totally preclude the use of aerial spraying will leave many weed sites untreated, including the Plains Forest Service horse pasture. These areas will continue to infest neighboring sites. I strongly urge the Forest Service to continue aerial application, at least on a limited basis where ground application can't be used. C

The Range Forage - Potential Loss model, page S-13, which quantifies range forage loss using the several control alternatives fails to take into consideration the resulting several-fold increase in forage production if the control measures are applied. More specifically I am referring to Tardon application to knapweed. You go from almost no forage production on a heavily infested knapweed site to the reverse, heavy stand of grass with a low percent of knapweed. This, of course, depends upon soils, moisture levels and many other factors. D

Forest Service Response
LETTER 18:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We assumed a 90% effectiveness rate for all treatments shown in all alternatives. The 1998 projections are based on the No Action 1998 acres, minus 90% of the treated acres for each species under each alternative. See EIS Appendix F for a detailed explanation of projection calculations.

B: The situation you describe at the Plains administrative pasture is a clear example of the issue that drove us to develop Alternative B, as well as include cooperation with adjacent landowners as a major component of Alternative C. That site would also fall into our highest Control Priority as discussed in EIS Chapter II.

C: We are not considering aerial application in this EIS because that method is neither necessary nor appropriate for most of the Lolo National Forest. If aerial application is appropriate in isolated cases, then that issue may still be addressed at the project level of environmental analysis, but project planning would have to analyze the effects of the method without the benefit of tiering to this EIS.

D: The summary that you refer to is more fully explained in the Range subsection of EIS Chapter IV. The model we used does assume that acres treated for weed control return to their original (weed-free) forage production. The chart shows very little overall range forage response to weed control because spotted knapweed and leafy spurge have the biggest impact on range productivity, but only a small protion of the current infestations are treated, even under Alternative E (24,280 acres of spotted knapweed treated compared to 225,000 acres currently infested). Although the residual plant community often responds quite well to treatment with picloram, many of the range forage sites on the forest are in or near riparian areas or other site types not suited to picloram use.

E: It has always been our intention to develop general guidelines and information that would aid project-level planning. The ranger districts will still have wide discretion when conducting project-level analyses. However, if they want to go beyond the issues addressed in this EIS (for instance, consideration of aerial application), they will have to conduct further in-depth analysis and public involvement.

Orville Daniels
Page 2

I would certainly commend the authors for their indepth study of the weed problems on the National Forest and the excellent manner in which they presented the Draft Environmental Impact Statement.

I am concerned that a too mild approach may become policy due to the loud protestations of the vociferous minority. Perhaps various approaches and alternatives can be used depending on the area and site. 1-1

Respectfully,

Bruce Icenoggle

cc: District Ranger Cindy Lane
Plains District

19

MONTANA STATE UNIVERSITY

Extension Service
Department of Animal and Range Sciences
Montana State University
Bozeman, Montana 59717
406-994-3414

FOREST SERVICE
APR 11 1990
RECEIVED

April 9, 1990

Mr. Orville Daniels
Forest Supervisor
USDA Forest Service
Lolo National Forest
Building 24
Fort Missoula
Missoula, MT 59801

Dear Mr. Daniels:

I recently reviewed the Draft Environmental Impact Statement on Noxious Weed Management, Amendment to Lolo National Forest Plan. The following comments are forwarded in effort to provide a more thorough analysis in the Final EIS.

The DEIS presents much information on the affected environment, environmental consequences, purpose and need, and background information. The FS staff responsible for preparing the document has obviously invested a great deal of time and effort into preparing the document. They deserve to be complimented for undertaking a difficult task.

I am concerned that the seriousness of noxious weeds has been under-estimated in the DEIS. The following examples support my view:

1) **Page S-12** "*Under no action, forage loss in 50 years may increase to 18 percent of the potential. Actual impacts on elk winter range productivity will likely be in the lower end of the 3-18 percent range. The estimated three percent loss in productivity is probably insignificant on a forest-wide basis.*" In my opinion, the above assumption is not consistent with Dr. Bedunah's research. If elk are forced to move to non-knapweed infested winter range---it is usually at lower elevations on private land. Thus, another problem. A

2) **Page S-13** "*The impacts of weeds on other resources are either ambiguous or insignificant.*" In my opinion, soil and water conservation is a serious concern on spotted knapweed-infested sites. (See Weed Technology - Vol. 3, Issue 4, 1989.) The assumption throughout the analysis, "that water and soils are not affected by noxious weeds" is clearly an error. B

Forest Service Response
LETTER 19:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: On a ***forest-wide*** basis, we still believe that our original analysis and assumptions hold, particularly within the context of the full discussion of our assumptions given in the Wildlife section of EIS Chapter IV. The "other problem" of potential increased big game depredation on private lands is one that we simply do not have enough information to evaluate. We do know that game depredation is often not closely linked to the availability of forage on public lands. Private land forage (alfalfa, irrigated hay fields, cereal crops, etc.) is inherently more palatable (thus more attractive) than the forage on dry, upland sites even in the absence of weeds. Because our worst-case projection is a 3-18% reduction in forage due to weeds, weeds will probably not severely aggravate the depredation problem. This is not to say that depredation is not a serious problem, we just don't know what, if any, role weeds may play in this problem. Elk mobility on and between winter ranges is a complex and poorly understood phenomenon. We have raised this issue as a research need to the Montana Department of Fish, Wildlife, and Parks, and to wildlife researchers at the state universities.

B: On a ***forest-wide*** basis, sedimentation and water-yield increases due to weeds will be insignificant. A relatively small class of sites on the Lolo may show significant increases in sedimentation and or water yield, but these effects would become virtually undetectable when placed in the context of watersheds and the ongoing soil-disturbance activities associated with forest management. We aren't saying that weeds do not affect water and soil resources, but that in the forest-wide scope of this EIS, those effects are insignificant. See the Water and Soils section of EIS Chapter IV for more discussion.

C: The growth curve for spotted knapweed in the DEIS is somewhat misleading. We believe that on the Lolo National Forest, spotted knapweed has already spread to most high- or moderate-risk sites and is actually ***late*** in the explosive phase. Most further spread on our forest will be increasing densities on already infested sites, not new infestations. A 3% growth rate on a base of 225,000 acres results in 7,000 additional acres, which is still a very significant acreage compared to all other weeds. We do not think this biases toward no action.

D: We believe that you've misinterpreted the summary. It does not conclude that livestock grazing is not important, it states that

Page 2
O. Daniels
4/9/90

3) **Pages II-12 and II-14** Acreage infested by Spotted knapweed is projected to increase 3% during the decade (in Alternatives A and B). In my opinion, the 3% value clearly underestimates the rate of spread. Several researchers (Morris and Bedunah 1984; Tyser and Key 1988; Lacey et al. 1990) report a much faster rate of spread. Furthermore, the graph depicting the population growth curve of spotted knapweed (page III-12) indicates that spotted knapweed has barely begun to express its ecological dominance. The narrative even admits that "spotted knapweed seems to have passed the latent period of growth and is now somewhere in the explosive growth region of its growth curve."

The projected rate of spotted knapweed spread needs further analysis. To underestimate the spread, simply bias's the EIS in favor of the no action alternative.

C

4) **Page S-5** The analysis states that "*less than 1% of wage and salary employment comes from the farm sector, of which livestock is one component. Thus livestock from the National Forest is not of significant importance to the local economy.*" In my opinion, it is inappropriate to report that the farm sector contributes little to wage and salary employment; and conclude that livestock grazing is not important. An economic study (Lacey and Johnson, to be published in June 1990) found that each AUM of livestock grazing on National Forests in 1988 contributed about $75 to Montana's economy.

The discussion that agriculture is not important is followed by a discussion of natural resource amenity values and the importance of mushroom and berry gathering. In my opinion, those opinions reflect an anti-weed control philosophy. Those opinions, stated in sequence, do not enhance the authenticity of the document.

D

5) **Page I-7** The issue of how the Forest can work with other interested or affected parties, such as adjacent landowners is of critical importance. Cooperation agreements with adjacent landowners is a valid approach. However, to limit it to landowners who have weed management programs coordinated through a county weed board (as in Alternative B) is too restrictive. The approach would prove detrimental to many landowners who have individual weed management plans. Therefore, Alternative C is preferred over Alternative B.

this activity is not *significantly important to the local economy*. The summary goes on to say that this activity is economically important to many individuals. Contrary to your interpretation, the EIS does not quantify nor evaluate the importance of amenity or lifestyle values in any absolute or even relative terms—it simply recognizes that different people hold these differing values. See the Social Setting section of EIS Chapter II for a more complete discussion of these issues.

E: We did not attempt a comprehensive economic analysis. Too many factors cannot be quantified in economic terms. Our strategy for economic analysis was to limit our discussion to those resources for which we have a basis for quantification. We felt comfortable doing that with only two resources: 1) livestock forage, and 2) big game winter range. Even those two areas are fraught with uncertainties, so much so that the resulting numbers should only be used for general comparison between the alternatives, not in any attempt to derive absolute dollar values for economic effects of weeds or weed control. This in no way is meant to imply that these are the only costs and benefits of importance. The Forest Supervisor will consider non-market and subjective issues as well as quantified economic information when he makes his decision.

The study you refer to (Lacey and Johnson. 1990. *Western Wildlands* 16(2):23-26) estimates the impact to the ***total state economy*** in terms of ***total gross output***. We feel that ***income changes in the local economy*** are more relevant than the total gross output figure you cite for the entire state. We've added a table to FEIS Chapter II (Table II-16) to display the economic impact of each alternative compared to the existing situation for the local economy of Flathead, Mineral, Missoula, Ravalli and Sanders counties. Economic impacts displayed include income and employment.

Page 3
O. Daniels
4/9/1990

6) **Appendix D** The management requirements for minimizing or preventing noxious weed spread are appropriate and should prove beneficial to FS resources.

7) **Pages II-35, and Appendix F** I was unable to find a description of the economic benefits of weed control. Did they include livestock and big game forage, conservation of soil and water resources, a protection factor from preventing weed spread to adjacent sites? Without a clear description of the economic benefits, I am skeptical of the authenticity of the economic analyses. The projected costs of knapweed control appear to be overestimated. A computer program recently developed at Montana State University (Griffith & Lacey, In Review) indicates that knapweed control is economically feasible (in terms of livestock forage) on many sites in western Montana.

In summary, I appreciated the opportunity to comment on the DEIS Hopefully, my comments will be used to improve the final EIS.

Sincerely,

John R Lacey

Dr. John R. Lacey
Extension Range Management Specialist

JRL:pk

Eastern Sanders County Sportsmen Club
P.O. Box 363
Plains, Montana 59859
Ph. (406) 826-3457

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR 12 1990
RECEIVED

April 11, 1990

Mr. Orville L. Daniels, Forest Supervisor
Lolo National Forest
Building 24, Fort Missoula
Missoula, Montana 59801

Dear Mr. Daniels:

The purpose of this letter is to comment on the draft Noxious Weed Management Plan for the Lolo National Forest.

1. We agree that the USFS must become involved in weed control to a greater extent than is now happening. However, state and private landowner practices seem to be of more concern in the noxious weeds issue than are federal practices. The USFS should be a responsible neighbor, but cannot realistically solve even its own weed problems alone. Thus it appears that alternative C is the most reasonable approach for the USFS.

2. We have mixed feelings about wide-scale use of herbicides. Our members are seriously concerned with water quality and with the possibility of long-term dangers from accidental spills, etc. However, we feel that some roadside and pasture spraying should be part of the management plan under carefully controlled circumstances.

3. We support biological controls of weeds and would support the use of FS monies to help state or private agencies develop those controls, some of which are already being used with moderate success. Though biological controls will never eradicate weeds such as spotted knapweed, neither will even the most extensive use of potentially dangerous herbicides. Thus, where trade-offs are possible, we support the biological direction for long-term management.

4. We are concerned about comments on page III-23 which indicate that present road systems will increase threefold in the future. Since roads are major culprits in noxious weed dissemination, since roads are more disruptive to wildlife than is logging itself, since roads are often designed for cheap logging rather than for necessary long-term management needs, we hope this increase can be forestalled. We fail to see how weed management and more roads can be anything but a contradiction in terms. A

5. We wish to comment as follows on specific mitigating procedures as found in section D.

Items 2,3,25,28,29: While these may be practical occasionally on a one-time basis, overall they are impractical since there is no reliable way to enforce them and often no practical way of bringing cleaning equipment to remote forest areas. Also this would put a frustrating and unnecessary burden on timber- and machinery-haulers. B

Forest Service Response
LETTER 20:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We're making every effort to incorporate weed prevention (including aggressive revegetation) into our road construction and maintenance activities. Appendix D includes a wide range of management requirements along those lines. Our focus in not on the quantity of road activities, but on where and how roads will be built.

B: These practices are not that difficult to enforce, and they are already being required by other forest management agencies. Portable cleaning equipment does exist, and cleaning does not have to occur at remote sites, it could be done "in town" between jobs or before final move-in.

C: We re-written these items in the Final EIS. We plan to make these requirements mandatory for Forest Service, contractor, and permittee activities, while strongly encouraging that other users adopt these practices.

D: Mowing is listed as only one of several options to meet the intent of this item.

page 2

Item 1: Since roads and attendant traffic seem to be a real culprit, we encourage timber harvest practices which use a minumum of roads, and we encourage road closures, grass seeding, and tree-planting on roadbeds once timber sales are done. A

Item 5: excellent practice

Item 9: If fertilizing actually helps give new seeding a headstart on noxious weeds, we support this practice.

Item 11: While this may be a good idea, it is virtually unenforceable. We suggest that it be strongly recommended and that the practice of packing in hay be discouraged wherever possible (short summer packtrips, for example) with pelletized feeds as the preferred alternative.

Item 12: We do not support this item. It is unenforceable. Without enforcement personnel on hand around the clock at every conceivable wilderness entrance, this practice would be neglected by all but the most naieve few of wilderness travelers. In addition, it should be considered that horses and mules on pasture before entering wilderness will seldom voluntarily ingest knapweed and other noxious weeds, thus rendering this item moot. Finally, developed and undeveloped trailheads which at present are used for a few hours by travelers would become major holding points (if the item were enforced) and thus would be degraded rapidly. The practice of cleaning manes and tails makes sense, but the rest of the item does not. C

Items 17 through 21: While all of these should be in practice, they should not be enforced in arbitrary or picayune ways which put on range leaseholders any greater share of the burden than is rightfully theirs.

Item 23: excellent practice

Item 24: The mowing aspect of this seems impractical, and, if better practices are in place, a needless expense. D

We represent over 100 people from a variety of occupations, experience, and political opinions. We hope the fact that this diversified group can agree on the items mentioned lends credibility to our stance. Thank you for the opportunity to comment on this serious problem.

Sincerely,

Austin Urion, president
Eastern Sanders County Sportsmen Club

FOREST SERVICE
LOLO NATIONAL FOREST
APR 1 3 1990
RECEIVED
21

MONTANA NATIVE PLANT SOCIETY

Clark Fork Chapter
April 12, 1990

Mr. Orville L. Daniels
Forest Supervisor
Lolo National Forest
Building 24, Fort Missoula
Missoula, MT 59801

Dear Mr. Daniels:

The Clark Fork Chapter of the Montana Native Plant Society supports the Lolo Forest in its attempt to control noxious weeds on the public lands. We believe their continued encroachment represents a threat to the integrity of native ecosystems. However, we find we are not able to fully support any one of the proposed alternatives presented in the draft environmental impact statement. Although all of the plants listed may be categorized as noxious weeds on the Lolo Forest, they differ markedly in their autecologies, potential for spread, and threat to forest communities. We believe that specific management plans for each of the species of concern be developed. We offer the following recommendations for each species :

Spotted knapweed: Spotted knapweed infestation is so widespread that extensive use of chemical controls does not seem advisable from an economic or environmental standpoint. We favor suppression in co-op areas and special management areas, and containment elsewhere using a combination of chemical, and biological controls.

Diffuse knapweed: Because of its potential for spread and its present limited coverage on the forest, we favor an attempt to eradicate diffuse knapweed in its currently limited populations.

Canada thistle: Even heavy chemical application seems ineffective against well established populations of this species because of its deep root-system and effective seed dispersal. We recommend active

A

Forest Service Response
LETTER 21:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: While we've developed forest-wide objectives for each weed species under each alternative, our more important objectives are situational—weed control projects and weed prevention practices will be decided at the ranger district level using analysis of conditions at particular places. Those situational decisions will be guided by the priorities, objectives, and standards given in the Forest Plan Amendment. We will consider both the unique biology of each weed and the unique situation at each place rather than adhering to strict treatment categories.

B: Our Forest Ecologist is aware of the sulfur cinquefoil situation. That plant will not be directly addressed in this EIS (provisions are made in this EIS for "new invaders"). However, analysis and management of undesirable plants that are not technically listed as State or Federal noxious weeds may use much of the analysis completed in this EIS.

C: Your suggestions for education, mapping (inventory), and cooperation with research agencies are incorporated in the descriptions of the action alternatives. Appendix D contains many requirements designed to prevent weeds and to mitigate soil disturbance. Appendix C describes how each weed control project will include post-treatment monitoring.

forest support of programs investigating appropriate biological control. We recommend particular attention be paid to monitoring this species in susceptible wetland communities where it has the potential to dominate the vegetation. In threatened wetland or riparian areas, it may be possible to control small populations with spot application of herbicide.

Musk thistle: Unlike Canada thistle, musk thistle may not pose a great hazard. We believe the weed can be tolerated. Biological control and reduction of potential seedbed by reducing disturbance seem the best options.

Goatweed: We recommend suppression in co-op areas and toleration elsewhere. Good biological controls against this species currently exist and should be utilized.

Houndstongue: This species is usually successful on heavily disturbed sites. It is usually problematic in western Montana only when its seed contaminates wool. Physical controls, such as topping or pulling should be adequate.

Leafy spurge: Like spotted knapweed, true eradication of leafy spurge is not possible. Larger populations should be inventoried and aggressively contained as well as possible by mowing, or other methods. There are new biological control options being developed through the APHIS program at Montana State University. Researchers at the Rocky Mountain Station's Forestry Science Lab in Rapid City, South Dakota have been conducting studies to determine the feasibility of using a combination of fire and chemical treatments to control leafy spurge. Outright eradication of small or satellite populations should be attempted before larger scale encroachment occurs. A

Tansy: Forest infestations are presently limited. Tansy can form monocultures in valuable riparian habitats. We recommend eradication with an emphasis on physical control methods

Dalmatian toadflax: Eradication of small populations with greatest emphasis on physical control such as pulling; spot herbicide treatment should be used where necessary.

Sulfur cinquefoil, (Potentilla recta), although not on the state noxious weed list, is rapidly expanding in western Montana. This weedy perennial was introduced from Eurasia. The autecology of this species has not yet been studied. However, it appears to be very successful in unshaded sites with coarse textured soils. The habitat requirements of sulfur cinquefoil may be similar tho those of spotted knapweed. The lower portions of the Blue Mountain Recreation Area provide and example of a heavy infestation of sulfur cinquefoil. Lolo Forest managers should consider taking a pro-active stance on sulfur cinquefoil so that it does not join B

3

spotted knapweed and leafy spurge as a major environmental problem in western Montana. B

The Clark Fork Chapter of the Montana Native Plant Society recognizes that active control measures must be taken against existing populations of many noxious weeds. It is our belief that to prevent further infestations of current problem species and invasion of new weeds, the Lolo Forest should make weed control a priority management issue. Education of Forest employees and permittees is crucial. Education should stress identification of weeds and ways to mitigate disturbance of sites during management activities should be stressed. The Montana State Department of Agriculture has education outreach programs available through the extension program and we strongly urge the Forest Service to sponsor in-service training using the available state resources. We also suggest that the Lolo Forest join in a cooperative effort with the APHIS program at Montana State University and consider devoting land to insectary development to provide an adequate on-site source of insect weed predators. C

For all weed species, accurate mapping of populations and regular evaluation of spread should be conducted. Disturbance by road building, scarification and other management activities can provide large amounts of potential seedbed for exotic species. Every effort should be made to reduce and mitigate soil disturbance, particularly in drier habitat types and riparian areas which appear to be more susceptible to weed invasion.

Where chemical control is necessary, monies and time should be expended to research methods that are most effective with the least impact. Adequate training of all personnel involved in herbicide application is critical. Post-application monitoring of native vegetation response as well as weed response should be conducted wherever herbicides are used.

We recommend a weed control plan that addresses the problem by considering the unique biology of each of the species in question rather than adhering to strict treatment categories. A

Sincerely,

Anne Bradley

Anne Bradley
for the Clark Fork Chapter of the Montana Native Plant Society

West 200 Arenas #407
Palm Springs, CA. 92263
4/8/90

Mr. Orville Daniels
Forest Supervisor Lolo N.F.
Bldg 24, Fort Missoula
Missoula, Mt. 59801

Reference Draft E.I.S.
Noxious Weed Management

APR 13 1990
RECEIVED

Dear Orville

Thank you for the EIS Draft Report and the opportunity to offer suggestion for your program.

My comments are short but to the points I am particularly concerned about. The attached copy of a "paper" I presented at the last "Knapweed Symposium" (Bozeman, Mt. April, 1989) together with the sample map and chart covering a fairly typical Knapweed Suppression job needed in our local part of Sanders County (which was a part of the paper presented) is also attached. I have also included a "flyer" to symbolize the "crying need" for an aggressive "public awareness" program on the noxious weed crisis in that part of Montana, as well as a "progress report" on what is and is not being done.

My comments follow:

A. Alternative "C" must be the Alternative selected although there is a phrase in the definition that bothers me and should be replaced by a better one. It is the last phrase in the last sentence of the definition; Quote: "accept low levels of the weed" that needs to be modified as it relates especially to the following typical situations:

① Mapping and "treating" spotted Knapweed infested areas that have spread, but also killing scattered initial Knapweed plant "starts" that now "line" almost every motor vehicle route, still comprises the basic suppression task. "Major" invasion "runs" can spread rapidly from the motor vehicle route if we do not monitor and "treat" them almost immediately as "starts" are found. The "lower the level" when the road is monitored and the "scattered starts" are found, the higher the priority should be for suppression before these "few plants" (low level infestation) start to spread and cause a more complex control job.

② Low levels of Spotted Knapweed that have developed to that stage, on especially relatively canopy-free lands, usually are slowly (faster if disturbed) increasing in density that will soon be described as "higher levels of weeds" and with increased acreage, increasing damage and much higher control costs. The suppression costs in most instances will be less of course while the infestation is at "low levels."

Forest Service Response
LETTER 22:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below is our response to your substantive comments on the content and accuracy of the EIS.

A: We've retained the phrase that bothers you ("accept low levels of the weed") as part of our definition ***suppress*** as used in Alternative C for spotted knapweed. However, we think that our definition of suppression actually accomplishes what you recommend in your points (1) and (2). Our definition of "suppress" (given in EIS Table II-1) includes "prevent seed production." We mean to apply that to sites such as roadsides where seeds could be picked up and transported to non-infested areas. By accepting low levels of weeds, we are simply recognizing that given spotted knapweed's extensive infestation in our area, and the fact that it may be present but will not ecologically dominate low risk habitat types (see the discussion of Area at Risk to Weeds in the Biological Setting section of EIS Chapter III), it is impractical pretend that we will totally eradicate spotted knapweed. Alternative C would focus knapweed control on places where it is causing serious resource damage or could serve as a seed source for other areas.

5. When forage grasses and especially low-shrub plants, are replaced by spotted knapweed in western Montana, the forage per acre production of key winter range forage is critically reduced. The carrying capacity of these key winter ranges for continues to become less. Infestations of the "the knaps" infestations slowly spread up and or down the slopes, from major [illegible] routes on the canyon floor, or the "ridge tops" or on the mid-slopes. They will continue to get worse and worse and if you are familiar with big game use of key winter ranges, you will know that game cannot remove the problem by going to another range." The key winter ranges for key winter forage use, are very specific and limited. Eventually, as the deterioration of the key winter forage becomes worse and major "takeover of knapweed" takes over" the heart of the big game herd habitat is significantly destroyed. Many key winter ranges of Big horn sheep, elk and both species of deer are being seriously damaged now. I trust that approval of Alternative C, operating at all "levels" of spotted knapweed, can finally suppress the infestation so that perennial grasses, grass like plants and forage shrubs can reclaim "high-vigor" growth and production for all wildlife in western Montana. More important, we trust that it will stop the spread and damage to western Montana key ranges before the magnitude of the impact is allowed to cause more irreparable and increasing damage to this great legacy in the future.

In this respect, I strongly believe that the damage that has been caused by spotted knapweed to wildlife, environment and water quality control in western Montana is probably, at this point in time, more damaging than the "Valdez oil spill". They can [illegible] [illegible] that [illegible] "clean-up", but the spotted knapweed (and spurge) crisis is still with us, in western Montana and will be for many years, until the foreign invasion is totally suppressed.

Yours sincerely, [illegible]

Please [illegible] [illegible] the [illegible] [illegible] FRED [illegible]

23

FOREST SERVICE
APR 16 1990
RECEIVED

April 9, 1990

Orville L. Daniels
Forest Supervisor
Lolo National Forest

DEIS - Noxious Weed Management

The Upper Nine Mile Weed Control District was organized in August of 1989. The District includes all private landowners in the upper Nine Mile valley starting at Sec. 2, T16N, R23W (see attached map). The 7,842 acres in the District are divided among 35 owners. Each owner has developed a three year plan for controlling weeds on a total of 3,543 infested acres. Some work has been done, with 800 acres treated in the past four years.

The goal of the Upper Nine Mile Weed Control District is to reduce the impact of noxious and problem weeds on agricultural production, wildlife habitat and the general aesthetics of the area.

A variety of control methods will be used including grazing management, cultivation, reseeding, mowing, biological control and chemicals. Plots have been set up by the Missoula County Noxious Weed Control District to monitor effects of chemical control on non-target species. Previous control work in the upper Nine Mile has shown that control of spotted knapweed for from three to five years can be accomplished using one pint of Tordon 22K per acre with no damage to native non-target species.

The upper Nine Mile valley receives heavy logging, wood cutting and recreation traffic yearlong. In order for the residents of the upper Nine Mile valley to accomplish their goals, we will need the cooperation of the U.S. Forest Service to control the spread of weeds from the many forest roads that are accessed from the Nine Mile county road. Gated roads would also need to be treated, as administrative travel at the wrong time of the year could spread weeds from these areas.

While Alternative E is the most desirable, we realize that it is

**Forest Service Response
LETTER 23:**

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

probably physically and economically impossible to accomplish, therefore, we recommend that Alternative C be selected. This appears to allow the Forest Service to cooperate with adjacent landowners and also control noxious weeds that affect other resources within the forest.

We also urge the cooperation of Champion, Plum Creek and State of Montana in control of noxious weeds in the upper Nine Mile.

Thank you.

Ralph Thisted

Ralph Thisted

Lester Robinson

Lester Robinson

Richard Ramberg

Richard Ramberg

Cochairmen, Upper Nine Mile Weed District

cc: Champion Timberlands
Plum Creek
State of Montana

MONTANA STATE UNIVERSITY
Extension Service
Mineral County Extension Office
300 River Street (Courthouse)
PO Box 730
Superior, Montana 59872
406-822-4561

FOREST SERVICE
APR 16 1990
RECEIVED

April 13, 1990

Mr. Orville Daniels
Forest Supervisor
USDA Forest Service
Lolo National Forest
Fort Missoula, Building 24
Missoula, MT 59801

Dear Mr. Daniels,

On behalf of the Mineral County Weed Board, I would like to express appreciation for the opportunity to comment on the Draft Environmental Impact Statement Noxious Weed Management Amendment to the Lolo National Forest Plan (DEIS). We also wish to thank Terry Egenhoff for coming to Superior to answer our questions and explain various portions of the document to us. Ellen Volmer and Roger Lindgren have been most amiable and available for assistance which is appreciated. We look forward to the cooperative projects expressed in the DEIS.

The perceptions we had after our initial viewing were as follows:
- -The problems caused by weeds are minimal and have little effect.
- -There is no economic incentive to control weeds.
- -Grazing has little or no significance on the Lolo National Forest.
- -Weeds do not spread.

After meeting with Terry, he assured us that was not the written intent. It is however the perceived intent. We feel that steps need to be taken to alleviate this tenor that is presented in the document. A

There is a great deal of research available that negates these aforementioned assumptions. The economic return of controlling knapweed is not addressed. Soil loss and water contamination due to erosion from weed infested sites versus grass or native vegetation is well documented.

Some comments:
Table on S-4: Current infestation and spread rate Estimates by weed species. Leafy Spurge and Dalmation Toadflax pose a greater threat than 100% and 150% spread rate, respectively. B

-Page S-5 : Agriculture interests and displacement of Forage for Big Game are similar problems. The amount of forage for game that is reduced by the presence of weeds increases the pressure placed on the "agricultural interests " forage for domestic stock.
- para 3 : Livestock forage could be significant to the local economy, in Mineral County, if weed control efforts were able to reduce the game populations share of the farmers/ranchers haystack. C

Forest Service Response
LETTER 24:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We've made some minor changes in wording in the FEIS, but we did not feel that there was a tenor in the document that needed to be alleviated. Others have read the DEIS and felt it was biased in the opposite direction. The EIS identifies several significant effects caused by noxious weeds. The weed spread rates used in this EIS result in significant increases in weed-covered acreage under the no action alternative. Grazing is recognized as a significant activity on the Lolo and range affects are given significant analysis.

Soil and Water effects caused by weeds are recognized in EIS Chapter IV, but on a ***forest-wide*** basis, in the context of watersheds and soil-disturbing activities resulting from ongoing forest management activities, any affects attributable to weeds is relatively insignificant.

Our economic analysis is admittedly limited, but that should not lead to the conclusion that there is no economic incentive to control weeds. Our strategy for economic analysis was to limit our discussion to those resources for which we have a basis for quantification. We felt comfortable doing that with only two resources: 1) livestock forage, and 2) big game winter range. Even those two areas are fraught with uncertainties, so much so that the resulting numbers should only be used for general comparison between the alternatives, not in any attempt to derive absolute dollar values for economic effects of weeds or weed control. In this EIS we have attempted to display those costs and benefits which can be quantified. This in no way is meant to imply that these are the only costs and benefits of importance. The Forest Supervisor will consider non-market and subjective issues as well as quantified economic information when he makes his decision.

B: The spread rates used in the EIS are forest-wide-average estimates. Different places around the forest may well experience different rates. Actual data that provides better estimates than those we originally made is not available.

C: While we did not quantify the effects of weeds on adjacent landowners, the EIS does recognize that those effects exist. In fact, this issue was important enough that the minimum action alternative focused on cooperating with adjacent land owners.

The "Hobby" farmers, as they are classed in this document, make up a fair proportion of the National Forest fringe population. By the nature of their land holdings they are forced to spend thousands of dollars each year on hay for their livestock. The number of AUM's that encumbers a producer's forage would be reduced by increasing the browse and grazing potential on forest lands for wildlife. Thereby increasing the amount of hay that would be available for local use or sale. C

para. 5 : On a percentage basis, are the "some" that are concerned with "naturalness" also a majority? Can these areas of concern be isolated on a project basis?
I consider a weed in an otherwise pristine environment an intrusion.
"Extensive use of chemicals" needs to be defined. Weed control does not have to endanger or dilute these pursuits. D

Page S-8 : Biological tools have been greatly expanded to include utilization of insects available for Knapweed and Leafy Spurge. Eight insects for Knapweed are approved and scheduled for release in the next two years. Five insects for the control of Leafy Spurge are being released. (Brochure-USDA APHIS Program aid number 1435) E

Page S-13: I disagree with the statement in paragraph 2. The worst case losses in the potential livestock grazing forage productivity would not increase from 12 to 23% in all alternatives except E. A historical perspective of this philosophy could be gained by looking at the past weed control efforts by the U.S. Forest Service. This is the attitude that got us to level of infestation we have currently.

Page S-14: A recent study conducted by John Lacey, MSU Extension Range specialist, states that an Animal Unit Month (AUM)on Forest Service Land is worth $75.0^ ~e1 year to the local economy. A current level of 9,600 AUM's on the LOLO National Forest equals $720,000.00 F

D-2 #5 Specify Certified Seed in addition to inspection. This will reduce the chance of Yellow Starthistle or other such weeds from being introduced. G

In conclusion, of the alternatives listed, the Mineral County Weed Board prefers alternative C.

- It provides the greatest opportunity for improving the current situation with the potential for increasing the use of biological controls as more tools become available.

D: These issues may well be addressed at the project level. However, counting attitudes or trying to ascertain "majority" values is not appropriate to our analysis. We have attempted to recognize and disclose that different values exist and they are affected in different ways by the same management action (or inaction).

E: Several new biological tools are on the horizon, but they are not available for operational use at this time. Rather than attempting to cover them all in this EIS, we'll evaluate them as they become available.

F: The study you refer to (Lacey and Johnson. 1990. ***Western*** *Wildlands* 16(2):23-26) estimates the impact to the ***total state economy*** in terms of ***total gross output***. We feel that ***income changes in the local economy*** are more relevant than the total gross output figure you cite for the entire state. We've added a table to FEIS Chapter II (Table II-16) to display the economic impact of each alternative compared to the existing situation for the local economy of Flathead, Mineral, Missoula, Ravalli and Sanders counties. Economic impacts displayed include income and employment.

G: In the FEIS and proposed Forest Plan Amendment, we've changed the management requirement that you mention to include your suggestion.

Ideally, our choice would be a mixture of alternatives C and D as being most beneficial. Place the Physical and Biological control emphasis of D, into alternative C. Then use Chemical controls in areas where risk is low, Physical control is impractical, and Biological control is too slow or not available. This will also set a precedent for future Noxious Weed efforts, demonstrating responsible, prudent use of all tools available for weed control.

Once again thank you for your consideration of these concerns.

Sincerely,

Kevin G. Chamberlain

Kevin G. Chamberlain
MSU Extension Agent, Mineral County

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Montana Department of Fish, Wildlife & Parks

FOREST SERVICE
APR 16 1990
RECEIVED

3201 Spurgin Road
Missoula, MT 59801
April 13, 1990

Terry Egenhoff
Lolo National Forest
Building 24
Fort Missoula
Missoula, MT 59801

Dear Terry:

Thank you for the opportunity to review the Lolo National Forest Noxious Weed Management DEIS. I would like to offer the following comments based upon a thorough reading of the Summary you provided.

We find the assessment of environmental consequences on wildlife to be reasonable and in line with our current state of knowledge. Specifically, we are pleased to see the Forest resist the temptation to equate potential winter range changes in some forage types to an unjustifiable estimate of elk population losses. Past attempts at such models by the Lolo Forest have led to public confusion over the potential effects of weeds on elk by projecting a future loss of elk to weeds without any reasonable data to support such a projection. Conversely, we find your approach in the current DEIS Summary to be informative, constructive and realistic.

We do not wish to indicate a preference at this time for any of the alternatives presented. However, we do strongly support an emphasis on the prevention of weed infestations through careful project planning in road placement, habitat types to be logged or otherwise treated, travel management, livestock grazing management, and other areas of potential impact. Whatever alternative is selected, we request a continuing opportunity to work with you on weed control and weed prevention on key wildlife habitats as they are identified on a case-by-case basis. We request that you keep all control options open for possible future use if needed to address individual, site-specific problems that might require the cooperative attention of both of our agencies.

Thank you for your consideration.

Sincerely,

Jerry Wells
Regional Supervisor

Forest Service Response
LETTER 25:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

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FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR 16 1990
RECEIVED

Dear Lolo National Forest,

I think it is very important that you do some spraying of your weeds!

I would like to see you concentrate on controlling the weeds on your roads & also next to adjacent land owners. If you would spray new roads after they are built to keep the weeds from getting started in any new areas. And spray your old roads to keep the seeds from spreading further.

I talk about just spraying because I feel that is the answer right now, I do feel that biological control is the ultimate answer. As of now, there is no biological control that has proved to work and until there is we all need to take measures to help control these noxious weeds. The areas with organized weed groups, trying to control these weeds, could especially use your help in spraying.

I sure hope you do some type of controlling your weeds!

Sincerely
Wayne Slaght
Ovando Valley Weed Group

Forest Service Response
LETTER 26:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

27

MISSOULA COUNTY

MISSOULA COUNTY WEED CONTROL
MISSOULA COUNTY COURTHOUSE
MISSOULA, MONTANA 59802
(406) 721-5700 Ext. 287

OFFICE LOCATION
3085 STOCKYARD ROAD

APR 16 1990

April 16, 1990

Orville L. Daniels
Forest Supervisor
Lolo National Forest
Building 24, Ft. Missoula
Missoula, MT 59801

Dear Mr. Daniels:

Missoula County Weed District is pleased to have the opportunity to comment on the Lolo Forest Draft Environmental Impact Statement for Noxious Weed Management. The Missoula County Weed Board has considered the five alternatives presented in the draft. The Weed Board prefers Alternative E - attempt to eradicate all noxious weeds on the forest. Realizing that Alternative E might not be economically or socially acceptable, the Weed Board would also accept Alternative C - control weeds that affect national forest resources and adjacent landowners who have active weed management programs.

The Weed Board would like to briefly comment on some of the 13 issues considered in the development of the draft EIS:

1. The federal definition of noxious weeds should include all weeds on the Montana State noxious weed list. The Weed Board supports the inclusion of additional plants if they are not native species. A

2. The affect on native vegetation may be understated. In cases of no management, entire plant communities may eventually be eliminated throughout the forest. The affect on endangered, threatened, or sensitive animals may be understated if they have a food or cover link to a potentially eliminated plant community. B

   The affect on both water quality and quantity may also be understated. In the case of spotted knapweed dominated communities, runoff is significantly increased resulting in increased erosion and possibly increased siltation in streams. C

   In the economic analysis, no value is given to aesthetics. This may understate the cost of existing noxious weeds and may understate the benefits derived from noxious weed control.

   The affect on wildlife and domestic livestock is understated because the impact of displaced big game on private domestic livestock range has not been considered. What is the cost to packers of replacing lost grazing in the forest with hauled in forage? D

5. The Forest should give priority to organized cooperative weed control projects. The Noxious Weed Seed Free Hay Program needs to be included as a noxious weed preventative measure. E

Forest Service Response
LETTER 27:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We included all noxious weeds that could be problems on the Lolo National Forest, based on all local county weed lists and Losensky's 1987 study (see the References Cited section of the FEIS).

B: Our assessment of effects on native plant communities and threatened, endangered, or sensitive species is based on the best information we could find regarding noxious weeds in our forest environments. We have seen no evidence to indicate that our estimated effects are understated.

C: We evaluate the effects of weeds on water and soils in FEIS Chapter IV. We find that there may be noticeable effects on certain site types, but at the forest-wide level of this analysis, and within the context of watersheds and ongoing soil-disturbing forest management activities, any effects caused by weeds would be relatively insignificant.

D: Our economic analysis is strictly limited to those thing that we feel we can quantify economically. That only includes weed control costs, big game winter range effects, and livestock grazing effects. Many other factors, including aesthetics and effects on adjacent land owners, are not quantified. This in no way is meant to suggest that these other factors are not important. The Forest Supervisor will consider non-market and subjective values in addition to the quantified economic information when he makes his decision.

E: We've revised the priorities in the FEIS – see the Control Priorities section of Chapter II, and the forest-wide objectives part of the proposed amendment to the Forest Plan.

F: Appendix D of the EIS contains several management requirements aimed at your concerns.

G: We're confused by the assertion that "too much weight is given to nontarget damage caused by herbicide" and the call for more research into the effects of weed control on nontarget species. We are required by regulation and common sense to evaluate the effects of reasonably foreseeable events. Even with the best of intentions, accidents can happen. We believe that this EIS presents a fair analysis of possible effects, given existing knowledge. We agree that more research would be nice. As we describe in Appendix

Lolo Forest Noxious Weed EIS
April 16, 1990
Page 2

6. Road systems are the most rapid route of spread for most noxious weeds and controls need to be implemented on road systems that are infested with noxious weeds to halt their spread. Road rights-of-way need to be revegetated as soon as possible after disturbance to reduce weed invasion. F

7. If herbicide labels are followed, the human and animal health effects should be positive. Too much weight is given to nontarget damage caused by herbicide. Damage to nontarget plants can be reduced to acceptable levels by adjusting herbicide choice, application rate, and application timing and method. G

8. The cost analysis used in the EIS is biased. It does not consider the affect of forest decisions on adjacent landowners. The Forest's lack of action has caused increased costs to adjacent agricultural producers by necessitating increased herbicide use and increased losses due to wildlife utilization. The Forest has not assigned a value to lost aesthetics. D

9. More research needs to be done regarding the affects of weed control on nontarget species. G

10. The Forest should not limit itself to only the three herbicides considered. The Forest needs to consider more herbicides or have a mechanism for screening new or other herbicides in the future if the need should arise. H

11. Aerial application should not be eliminated from consideration. In many cases it is the most economical, as well as the safest, method of application.

If "no risk" means 0.0 percent chance of an adverse reaction, "no risk" should be replaced with "acceptable risk" and this risk level should be established for each situation where "no risk" is now used. There is some risk involved with any human activity. 0.0 percent risk does not exist.

13. The Forest Service needs to conduct more research in the area of noxious weed management in its particular environment, i.e., resource management with a multiple use mandate. I

Educational and training activities could be coordinated with local weed districts and the Montana Weed Control Association. Identifying the local Forest Service employee responsible for weed management would help this coordination.

Thank you for your consideration. The Missoula County Weed District is looking forward tc hearing from you regarding the direction that will be taken for the Lolo Forest's weed management program.

Sincerely,

William J. Otten

William J. Otten
Weed District Supervisor

WJO:lsl

C, weed control projects would have to include post-treatment monitoring to collect information on the effects of control on nontarget species where this is an issue.

H: We limited the range of chemicals and application methods analyzed here to those that we judged to be most appropriate to our situation. This does not prevent the use of other chemicals or application methods in the future if project-level analysis indicates that alternatives should be considered. It simply means that in such a case, the project-level analysis would have to conduct additional analysis similar to that presented in this document.

I: We agree with the need for additional research and information programs, and have included those issues in the descriptions of the action alternatives. The local contact for all management activities is the district ranger. For Missoula County, that would include the rangers at Missoula, Ninemile, and Seeley Lake ranger districts.

April 13, 1990
860 River Rd N.
Plains, Mt. 59859

FOREST SERVICE
APR 17 1990
RECEIVED

Orville Daniels, Forest Supervisor
Lolo National Forest
Building 24, Fort Missoula
Missoula, Mt. 59801

Dear Sir:

After reading th Draft EIS on Noxious Weed Management, I believe Alternative C is the best approach.

I am concerned your mitigating measures are not realistic in many cases. You do not have manpower enough to enforce more rules when many you already have go ignored. Specifically, your gate closure enforcement is token in the last five years.

Road Building and Timber Harvest with all the opened soil are the worst cause for the spread of weeds. If you can control weeds in these activities, you will be able to control weeds on National Forest Land.

Sincerely,

Fred Cavill

Fred Cavill

Forest Service Response
LETTER 28:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

29

Wild Horse Plains, Montana

479 Lower Lynch
Plains, MT.
3/29/90

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR 17 1990
RECEIVED

Dear People;

I'm writing to tell you that we are really glad that you are trying to fight the weeds in the back country. The Lolo Plan is a wolf in sheep's clothing. The part of the Lolo Plan we have trouble with is letting the stock stand 24 hours at the trail head. The idea sounds good at first, but who will keep track of the Trail heads? Will you have water at all the trail heads for stock? That's just two of many things we came up with in the first few seconds of talking about it! We must all fight weeds, but I sure we can find a better way than to have stock standing at the trail heads for 24 hours.

A

Thanks,
Jean + Terry Melton
Jean + Terry Melton

Forest Service Response
LETTER 29:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below is our response to your substantive comment on the content and accuracy of the EIS.

A: The stock-quarantine requirement is just one of many things we will be trying to implement to reduce weed spread. We may well find that some of these ideas don't work, or that there are better ways to accomplish our intent. We hope to refine these things as we go, with cooperation and involvement of all national forest users.

James Phelps
Public Lands Chair
Montana Audubon Council
2110 Bradbrook Court
Billings, Montana 59102

April 14, 1990

Lolo National Forest
Building 24, Fort Missoula
Missoula, Montana 59801

Gentlemen:

Please be referred to your draft Environmental Impact Statement (draft EIS) on Noxious Weed Management, an amendment to the Lolo National Forest plan, dated December 1989.

This will advise that the Montana Audubon Council concurs with the comments to the draft EIS weed plan submitted to you by the Five Valleys Audubon Society.

The Montana Audubon Council is the coordinating entity of the nine National Audubon Society chapters that are located in Montana, and as such we are interested in these kinds of environmental decisions. Please keep us on your mailing list.

Very truly yours,

James Phelps

Public Lands Chair

Forest Service Response
LETTER 30:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

31

Harry E Wilson
2120 N Callow Ave
Bremerton, WA 98312-2908
April 14, 1990

FOREST SERVICE
LOLO NATIONAL FOREST
MONTANA
APR 18 1990
RECEIVED

Forest Supervisor
Lolo National Forest
Building 24
Fort Missoula
Missoula, MT 59801

Dear Sir

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for Noxious Weed Management Amendment to Lolo National Forest Plan.

I believe that Alternative D should be the preferred alternative. Using physical and biological methods with a last resort using chemicals although more expensive with help keep the environment free of pesticides.

Would it be possible to just use chemicals around Special Management Areas 2, 3, 5, 7, and 8? Physical Methods should be used around MA 6,12, 14, and 28. A

Thank you for your time and consideration.

Sincerely

Harry E Wilson

Harry E Wilson
2120 N Callow Ave
Bremerton, WA 98312-2908

Forest Service Response
LETTER 31:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below is our response to your substantive comment on the content and accuracy of the EIS.

A: Assuming an alternative that includes chemical use is chosen, all decisions regarding weed control methods will be made at the project level, using analysis and public involvement that is tailored to actual places and their unique situations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII, MONTANA OFFICE
FEDERAL BUILDING, 301 S. PARK, DRAWER 10096
HELENA, MONTANA 59626-0096

FOREST SERVICE
LOLO NATIONAL FOREST
MISSOULA, MONTANA
APR 23 1990
RECEIVED

Ref: 8MO

April 20, 1990

Orville L. Daniels
Forest Supervisor
Lolo National Forest
Building 24
Fort Missoula
Missoula, Montana 59801

Re: Noxious Weed Management, Amendment to Lolo National Forest Plan, Draft Environmental Impact Statement

Dear Mr. Daniels:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Environmental Protection Agency's Region VIII Montana Office (EPA) has reviewed the referenced draft environmental impact statement (EIS). The information presented in this document is clearly written and well organized. The format and general content represent a good effort on the part of the writers to meet the intent of NEPA. Identification of a clearly preferred alternative is hampered by the absence of certain additional information discussed below.

1. The document should identify the criteria on which development and evaluation of the alternatives is based. These criteria would help to rank the alternatives based on the degree to which each meets the stated goals and objectives. This would allow greater objectivity in comparing alternatives and selecting a preferred alternative. Chapter II provides a good summary of the relative differences between alternatives for a number of topics beyond the issues and objectives stated in Chapter I. However, the critical criteria on which the alternatives are based is obscure. For example, in the comparison of indirect actions, what was the rationale for varying the level of the information program among the alternatives? Funding appears to be the limiting factor, although it is not clearly stated. Clarifying the criteria used to evaluate the differences between alternatives, as well as the relative effectiveness of each alternative in meeting the program goals, will provide a more rational basis for comparison. A

2. In comparing the costs of the alternatives on pages II-35 and 36, it is not clear if the costs of mitigation and monitoring were included. Presumably they were not. B

Forest Service Response
LETTER 32:

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: The development of alternatives is explained in the first eight pages of EIS Chapter II, and in Appendix F. First, a general objective statement (covering control objectives and methods) was developed for each alternative—see the description of each alternative in Chapter II. Based on that general objective, each weed species was given a control objective (Table II-8) and assigned treatment acres by control method as explained in Appendix F. The scope and intensity of indirect methods was tailored to the general objective for each alternative. Funding was not a limiting factor, but was used as a measurement for display and comparison purposes. For example, the inventory program in Alternative B ($5,000) is less than the other action alternatives not because funding is limited, but because the area to be inventoried would be less than in the other alternatives (see Table II-9).

We haven't ranked the alternatives nor developed additional comparisons that would appear more "objective." Many aspects of the noxious weed management problem in western Montana are highly subjective, as witnessed by this whole chapter of the EIS. We feel it best to recognize that. As you note, Chapter II compares the alternatives by the issues and objectives stated in Chapter I, by indirect and direct action levels, by economics, and by environmental effects. We feel that this presents enough comparative information to the decision maker and to the public for each reader to draw her or his own conclusions. The Record of Decision will contain a full explanation of the Forest Supervisor's rationale for making his decision.

B: Mitigation and monitoring costs are not included in the economic comparisons. We did not attempt a comprehensive economic analysis in this EIS. Too many factors cannot be quantified in economic terms. Our strategy for economic analysis was to limit our discussion to those resources for which we have a basis for quantification. We felt comfortable doing that with only two resources: 1) livestock forage, and 2) big game winter range. Even those two areas are fraught with uncertainties, so much so that the resulting numbers should only be used for general comparison between the alternatives, not in any attempt to derive absolute dollar values for economic effects of weeds or weed control. This in no way is meant to imply that these are the only costs and benefits of importance. The Forest Supervisor will consider

Alternatives B, C, and E, in that case, would have an even greater disparity between costs and benefits. Specifying the factors which directly impact the comparison of the alternatives for a specific issue, again improves the basis for comparison. B

3. The deferment of all monitoring plan development to the selection of the preferred alternative is inappropriate for the purposes of the comparative analysis required by NEPA. In ecological systems of the size and complexity of a national forest, it is not possible to predict with absolute certainty the complete impacts or the mitigation effectiveness of any control action. For the area and type of activities covered in this EIS, monitoring of implementation, efficacy and possible adverse impacts is an integral part of mitigation.

The specificity of the monitoring plan at the forest level is not expected to approach the level of refinement which can be achieved for a specific project. However, as with the mitigation outlined in Appendix D, certain basic elements can and should be included as they apply to any and all alternatives. In order to provide the comprehensive basis for comparison required by NEPA (40 CFR 1502.15, and 1502.16) the mitigation, including appropriate monitoring, should be addressed. The extent to which these elements vary among alternatives is important to this comparison. As indicated in item 2 above, the costs of mitigation should be provided where possible. The viability of funding, implementation and enforcement of these mitigation and associated monitoring should be assured. C

4. As stated on page II-35, compared to Alternative A, none of the other alternatives are particularly cost effective. This comparison, as well as the variability in the location and impact of weed infestations, seems to indicate that a decision to implement any of the action alternatives at a forest wide level may be inefficient. It may be more appropriate to modify the Forest Plan to: 1) Allow these decisions to be made at a project specific level on a case by case basis utilizing the environmental document (EA and/or EIS) appropriate to the scope of the issues and area. 2) Establish in the Forest Plan the basic mitigation (i.e. Appendix D) and monitoring plan requirements. These would include any standard minimum requirements, action levels, feedback loop and corrective actions. This plan would form the basis for site specific applications with appropriate modifications addressed in the EA or EIS for that project. B

This approach assumes that the low benefit to cost ratio for the forest overall may obscure specific areas or circumstances where the costs of control would be justified. It would

2

non-market and subjective issues as well as quantified economic information when he makes his decision.

We did not do an overall benefit/cost analysis for this EIS. Cost-effectiveness has very limited applicability as an evaluation criterion because so much of this management problem is subjective, not quantifiable, and/or not well suited to economic analysis. The benefit/cost values in Table II-15 only apply to the issues given in the table's title—value of potential range and wildlife outputs. Many other weed control benefits are simply not represented in those numbers.

We believe that the alternatives presented in this EIS accomplish what you call for: (1) they are permissive—they allow decisions to be made at the project-specific level, and provide a body of analysis to tier to or incorporate by reference, thereby preventing redundant analysis and documentation; (2) they establish in the Forest Plan the basic mitigation and monitoring requirements to be met by any projects.

C: We should have included a monitoring plan in the DEIS and have corrected the omission in the FEIS. The monitoring plan specifies items at the Forest Plan level and provides some advice for project-level monitoring. Each project would have its own environmental analysis, public involvement, documentation, and decisionmaking. The details of on-the-ground monitoring would be developed at the project level.

provide flexibility to respond to locally sensitive issues, such as infestations in critical habitat or response to potential cumulative impacts from adjacent non-federal lands. B

In summary, we recommend that the draft EIS be modified to include pertinent evaluation criteria. Mitigation should include provisions for monitoring as they apply to any or all alternatives. The monitoring plan should establish parameters, locations, frequency, action levels, response actions, and the schedule and responsibility for implementing these activities. These provisions should be outlined at a level appropriate to the scope of this analysis. At a minimum, the plan should establish the procedures and criteria for defining these components at a site or project specific level. The negative benefit to cost ratio for implementation of any of the action alternatives forest wide, may warrant reconsideration of the scope or structure of the proposed alternatives.

In accordance with the criteria that EPA has established for rating draft environmental impact statements, we have rated this draft EIS as category EC-2 (Environmental Concerns - Insufficient Information). A copy of EPA's rating system is attached for your convenience. If you need any further EPA assistance, please feel free to contact Lee Shanklin of my staff at (406) 449-5486 or FTS 585-5486.

Sincerely,

John F. Wardell, Director
Montana Office

33

DEPARTMENT OF HIGHWAYS

STAN STEPHENS, GOVERNOR — STATE OF MONTANA — 2701 PROSPECT AVE.

HELENA, MONTANA 59620

FOREST SERVICE

APR 30 1990

RECEIVED

April 26, 1990

U.S. Department of Agriculture
Forest Service
Lolo National Forest
Fort Missoula - Building 24
Missoula, MT 59801

The Montana Department of Highways has reviewed the Lolo Forest Draft Noxious Weed Management Plan and finds it well written and informative.

The department supports the Forest Service efforts to control noxious weeds on their property and cooperates with public agencies and the Montana County Weed Districts to control noxious weeds.

David S. Johnson

David S. Johnson, P.E.
Preconstruction Engineer
Preconstruction Bureau

DSJ:LJI:cm:4/c

cc: R. E. Wrigg
Environmental Section

Forest Service Response
LETTER 33:

Thank you for taking the time to comment on the DEIS. Your comments will be considered by the Forest Supervisor when he makes his decision.

West Nine Mile Road
Huson, Montana 59846
April 30, 1990

MAY - 1990

Orville L. Daniels
Forest Supervisor
Lolo National Forest
Building 24, Fort Missoula
Missoula, Montana 59801

Dear Mr. Daniels:

I apologize for the lateness of my response to the DEIS for Noxious Weed Management on the Lolo Forest, and hope you will include it in your considerations. Although I began on time with the Summary DEIS, I soon had enough unanswered questions in my mind that I sent for, and began digesting the full document which has taken a long time in between other obligations.

The alarming increase of weed infestations in our region in the past 15 years is an extremely serious matter and of great concern to me; I was therefore pleased to see Noxious Weed Management added to the Lolo National Forest Plan. I support the three IPM fundamentals which you list on p. II-1, and your Control Priorities as stated on p. II-3. In general, I feel your staff did a fine job with an incredibly complex problem, and reading the DEIS left me with positive feelings about the current trend toward ecological sensitivity in management of the Forest.

To begin ...

Since serious ecological damage results from both weed infestations as well as the treatment of same, there is a priority need for an overall emphasis on information programs targeted at both intra/inter agency personnel and the general public to emphasize what the DEIS terms "cultural" forms of direct weed control activities as mentioned on p. II-4:

> . . . any practice that favors the retention or introduction of desirable plants that can dominate or out-compete weeds. . . .

Combined with your management requirements for weed prevention (Appendix D), I think we'd have a formidable defense network against alien invader species. You mention (p. III-14) public apathy toward the weed problem--a large part of this might be lack of knowledge as to the critical scope of this invasion, as well as what each individual can do to combat it. Community esprit de corps would be invaluable.

In the same vein, the decision to eliminate from detailed study an Alternative to inhibit new road construction on the | A

**Forest Service Response
LETTER 34:**

Thank you for taking the time to comment on the DEIS. All of your comments will be considered by the Forest Supervisor when he makes his decision. Below are our responses to your substantive comments on the content and accuracy of the EIS.

A: We still feel that this is not the appropriate forum for analyzing a moratorium on road construction. We feel that we've provided a reasonable range of alternatives and an extensive set of management requirements to mitigate weed effects associated with road construction. While it is true that opening up the canopy for a road may create a microsite that is more hospitable to weeds than the original condition, the point of our statement that you quoted is that weeds are not likely to spread beyond the roadside in densities that would have ecological effects in those environments.

B: Budgets were not a limiting factor in developing the alternatives. We used the dollar figures to display and compare estimated program levels under each alternative. The program levels were tailored to the general objectives of each alternative. Actual funding available for each program will depend on the budget that the forest receives through the Congressional appropriations process. The Forest Supervisor has the discretion to mix elements of different alternatives as you suggest into the final decision that he makes.

C: When developing the alternatives, the interdisciplinary team did not feel that those activities were needed to meet the general objectives of any alternatives but E. The Forest Supervisor has the discretion to mix elements of different alternatives as you suggest into the final decision that he makes.

D: The large acreages of spotted knapweed and leafy spurge, along with the resistance of leafy spurge to existing control techniques makes eradication of either plant on the Lolo unrealistic without massive expense and effort. Except in Alternative E, suppression or containment existing infestations and prevention or eradication of new infestations is in keeping with overall objectives.

E: These questions can only be answered at the project level, with long-range monitoring. Appendix D includes a requirement to ensure that all herbicide-treated sites are revegetated with desirable plants.

F: Given existing information, we have no basis to suspect that weeds have any significant effects on nongame wildlife, beyond the speculation that weed-dominated grass sites may have increased risk to avian predation for ground-nesting birds. Even if this effect is true, it would not be significant to the ground-nesting populations

Orville L. Daniels
Lolo National Forest
Page 2

Forest was both political and premature. To do this on the grounds that to study it would be too demanding on the economies of time and money (p. II-9) relegates us to National Forest practices that throw good money after bad. Given the incredible budget allocations for road construction on the Forest, not to mention subsidized harvesting, perhaps these funds would be better spent for exactly such a study. To reiterate ... "retaining brush and tree canopy cover" is a cultural direct weed control activity (p. II-4, DEIS). To justify new roading on the grounds that most of it "will occur in higher elevation, moist sites, with dense canopy cover where noxious weed impacts are often slight or nonexistent" (II-9) is self-contradictory as these weed inhibiting habitat conditions will obviously no longer exist once roading begins. Moreover, harvesting timber has never been known to exactly underwrite the Forest's other obligations under multiple use mandates.

A

As a second preliminary comment, I do not believe that cooperative lands should be treated with any greater importance or priority than Forest lands--Forest lands belong to members of the public too!

As to the Alternatives, it's probably too late for "D" which would have been far preferrable ecologically. Therefore a combination of Alternatives C and E, essentially a strengthened "C," is proposed as follows.

Funding

Alternative E is disturbing with its potential for serious ecological damage. It is not clear that the noxious weed problem could not be reduced to a level more competitive with that of Alternative E were the other Alternatives (more specifically C) allocated an equivalent total budget. What could be done (e.g., acres treated and how, increased scope of indirect activities, etc.) for the same amount of money, i.e., the $1,422,880 annual cost of Alternative E? Wouldn't this be a more accurate way to analyze these Alternatives--starting from a common point of feasibility, or what the budget will allow? Specifically:

1. Why not $12,000, as allocated for Alternative E, for information programs including an ad campaign under Alternative C? (Please refer to comments re need for information programs on page 1, and again under Indirect Actions, p. 3.)

2. Why not $25,000, as allocated for "E," for a biological research program under "C"?

3. Mapping--again $60,000 vs. $10,000 for "C"? Or, if intensive mapping would be of little use under "C" (would this not help tracking new or existing infestations?), why not put these funds into a more effective program?

B

averaged across our entire forest. By identifying the possibility of this effect, we've raised a research need and an issue that must be analyzed at the project level.

G: We considered doing a dermal absorption analysis. A comparable EIS done in the south (Vegetation Management in the Coastal Plain/Peidmont) analyzed both dermal and ingested toxicity. In reviewing that EIS we noted that adverse risks of dermal absorption were minimal compared to ingestion. Since our initial analysis showed little risk of health-related problems for all animals from direct or indirect ingestion, we concluded that calculating the effects of dermal absorption would be a meaningless exercise. Human ADIs are set for daily exposures over a human lifetime. ADIs have no value for evaluating wildlife exposures that would occur vary rarely in any animal's lifetime. This is not a situation that is generally replicated in the wild.

Toxicity research indicates that sensitivity to toxins tends to be comparable within genera. For instance, 1080 is equally fatal to all canines including dogs, wolves, coyotes, and foxes. Mustelids (weasel family) or ursids (bear family) have a relatively high tolerance for 1080. The same relationships tend to be true for other toxins. While toxicity data was not available for all genera occurring on the Lolo, enough representative species were analyzed that it appears that the risk to other species is adequately identified. LD_{50} levels are expressed in terms of toxin concentration per unit body weight (mg/Kg) to minimize problems of comparing doses for different body sizes.

H: We have no data on hypersensitivity in animals. In humans, an extremely small portion of the population seems to be affected. Even if a few individual animals are affected, the impacts on local wildlife populations would not be significant.

I: Our literature review indicated that the latex in leafy spurge may cause blisters in humans and cattle. This is not considered a significant effect. Goats and sheep have been are continue to be used for leafy spurge control throughout the western U.S. with no significant adverse effects on the animals.

Orville L. Daniels
Lolo National Forest
Page 3

Indirect Actions

Why is Alternative E the only one to include:

1. A revised travel plan for more area and road closures to motorized use?

2. An extensive information program including an ad campaign? The latter could be highly conducive to instilling public motivation to help out in the "war on weeds"--e.g., pull them when you see a new infestation on your favorite trail, in your favorite campsite, etc.

C

Both of these should be included in whichever Alternative is selected.

Direct Actions

The DEIS statement regarding Alternative C:

> Little or no large scale treatment of spotted knapweed or leafy spurge would be anticipated due to the low likelihood of any significant long term decrease in these weeds (p. S-16)

is difficult to understand. Isn't this the point of a Noxious Weed Management Plan? Although Losensky's study apparently indicates otherwise, in my opinion these two species are most needing "control." In fact "C" and "E" could be strengthened as follows:

D

Leafy Spurge - Eradicate new infestations and roadsides (physical control); suppress elsewhere (method as appropriate*).

Spotted Knapweed - Eradicate new infestations and roadsides (physical control); suppress where canopy <55% (method as appropriate*); contain elsewhere (physical/biological control).

* Use of herbicides should be restricted to the central area of large infestations and the perimeter treated by physical methods.

Aside from diffuse knapweed which should also be eliminated where possible, I have not experienced (as plant ecologist, reclamation biologist, home landscaping with native plants, backpacker) serious problems with other weed species listed and do not have particularly strong feelings as to their insidious nature.

Orville L. Daniels
Lolo National Forest
Page 4

A troubling thought--

Alternative E treats 13,270 total acres/year (Comparison of Direct Control Treatments, p. S-21). If, after ten years, the change is only a difference of 16,000 acres (Change in Total Weed Acres, p. S-21), is this worth the risks of heavy herbicide use?

What happens once a large infestation is "overcome"? Will reestablishment of desirable vegetation be undertaken on all lands successfully (more or less) treated for eradication/suppression per management requirements for all other project planning (Appendix D)? Can revegetation succeed in these areas, especially long range? (Again, the question arises, should new construction activities be banned on the Forest?)

E

Nongame wildlife species received short shrift in the DEIS. The half-page analysis entitled "Nongame and Predators" (pp. IV-17, 18) is filled with second guessing ("no literature is available in this field") and contradictions (re ground-nesting birds: "Knapweed ... appears to provide better cover than native grasses ....," but "... visibility by a ground predator ... may be enhanced over native grasses due to the sparse structure of adult knapweed. Additionally, the sparse nature of knapweed heads probably makes ground-nesting birds more visible to avian predators.") Given the acknowledged paucity of data as regards nongame species, how can each Alternative conclude: "No significant effects are expected on non-big game wildlife." (Summary of Impacts by Alternative, pp. IV-34-41)?

F

Re animals, the statement:

> Other methods of exposure such as <u>dermal absorption after walking through treated vegetation</u> would result <u>in insignificant dose levels</u>, so they are not included in this analysis" (p. IV-18)

is in marked contrast with:

> Workers using picloram or glyphosate ... would exceed ADIs [acceptable daily intake] only <u>if they failed to use protective clothing</u>. All workers <u>using 2,4-D could possibly exceed the ADI</u>, and <u>those failing to use protective clothing</u> could <u>receive doses approaching the NOEL</u> [no observed effect level]." (p. II-38)

6

The toxicity tests (p. IV-19, Table IV-3) have little/no relational value to wildlife in a herbicide treated area. Not only are they limited to ingestion and do not consider dermal

Orville L. Daniels
Lolo National Forest
Page 5

absorption, but both behavior patterns and overall body weight/size are different for domestic lab animals than for their supposed wildlife counterparts in the field (pp. IV-18, 19, Table IV-2). For example, if the LD_{50} for chickens is 541 mg/Kg of 2,4-D, the proposed application rate of 250 mg/Kg would not be exactly "healthy" for a Cassins finch, chickadee, etc. I'm also appalled, frankly, at USFS use of the LD_{50} test, especially for these kinds of purposes, i.e., to supposedly simulate in-the-field conditions/events. G

Again, what is known regarding hypersensitivity of animals to the use of herbicides? Re humans, the DEIS (p. IV-3) states that " ... those that have it can suffer severe and long lasting symptoms after relatively small doses." H

A final consideration regarding animals--domestic this time--concerns the use of goats as biological control for leafy spurge. It's my understanding that a long term steady diet of leafy spurge can severely deteriorate the physiology of the animal due to the presence of toxins. Perhaps this should be addressed under "Effects of Biological Control"? I

Thank you for your time and consideration. I would appreciate acknowledgment of your receipt of this letter.

Sincerely,

Eleanor Danesh
B.A. Environmental Biology;
M.S. Candidate, Environmental Studies

ed

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REFERENCES CITED

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GLOSSARY

Glossary

A

Acceptable Daily Intake (ADI)	The maximum dose of a substance that is anticipated to be without lifetime risk to humans when taken daily.
Acid Equivalent (a.e.)	The amount of active ingredient expressed in terms of the parent acid.
Active Ingredient (a.i.)	The pesticide compound or toxicant which produces the desired effect of the formulation. Pesticide formulations are typically 1 to 50 percent active ingredient; the remainder being carriers, solvents, emulsifiers, etc.
Allelopathic	Pertaining to the suppression of growth of one plant species by another through the release of toxic substances.
Allotment	See range allotment.
Ameliorate	To make better; improve; lessen the effect.
Animal Unit Month (AUM)	The quantity of forage required by the equivalent of a 1000 lb. mature cow for one month.
Annual (plant)	A plant species living and growing for only 1 year or season.
Aquatic ecosystem	A stream channel, lake or estuary bed, the water itself, and the biotic communities that occur therein.
Aquifer	An underground zone of earth or rock saturated with water whose upper limit is the water table.
Arterial roads	Roads comprising the basic access network for National Forest System administrative and management activities. These roads serve all resources to a substantial extent, and maintenance is not normally determined by the activities of any one resource. They provide service to large land areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes. The location and standards are often determined by a demand for maximum mobility and travel efficiency rather than by a specific resource management service. Usually they are developed and operated for long term land and resource management purposes and constant service.
Aspect	The direction a slope faces.
Assay	A test or measurement used to evaluate a characteristic of a chemical. See bioassay.
AUM	See Animal Unit Month.

B

Biennial (plant)	A plant species that completes its life cycle, from seed germination to seed production, in 2 years. Also means "to occur every 2 years," as in biennial burns.
Big game	Those species of large mammals normally managed as a sport hunting resource.
Big game winter range	The area available to and used by big game through the winter season.
Bioaccumulation	The process of a plant or animal selectively taking in or storing a persistent substance. Over a period of time, a higher concentration of the substance is found in the organism than in the organism's environment.
Bioactivation	A process whereby a plant takes in an apparently harmless chemical, which yields toxic breakdown products when metabolized by the plant.
Bioassay	A method for quantitatively determining the concentration of a substance by its effect on the growth of a suitable animal, plant, or microorganism under controlled conditions.
Biological control	Pest control without the use of chemicals, machines, fire or hand tools. Parasites, grazing, predators, diseases, etc. are used to control pests.
Biological evaluation	An assessment required by the Endangered Species Act of 1973 to identify any threatened, endangered, or sensitive species which is likely to be affected by a proposed management action, and to evaluate the potential effects of the proposed action on the species or their habitats.
BLM	U.S. Department of Interior; Bureau of Land Management.
Boom (herbicide spray)	A tubular metal device that conducts an herbicide mixture from a tank to a series of spray nozzles.
Broadcast application	Uniform distribution of an herbicide over an entire area.
Broadcast burn	Allowing a controlled fire to burn over a designated area within well-defined boundaries, for reduction of fuel hazard, as a silvicultural treatment, or both.
Broad spectrum pesticides	General-purpose pesticides with a wide range of uses. They are effective when several different pests are a problem to control.
Browse	Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs which are utilized by big game animals for food.
Buffer strip	A strip of vegetation or ground that is left untreated.

C

Cancer potency	A measure of the relative ability to cause cancer.
Canopy	The cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.
Carcinogen	Any cancer-producing substance.
Carcinogenic	Producing or inciting cancer.
Carcinogenicity	Tendency of a substance to cause cancer.
Carcinoma	A malignant or cancerous tumor.
Carrier	Material added to an active ingredient to facilitate its preparation, storage, shipment, or use.
Carrying capacity	1 (recreation: the amount of recreation use an area can sustain without deterioration of site quality; 2 (wildlife): the maximum number of animals an area can support during a given period of the year; 3 (range): the maximum stocking rate possible without damaging the vegetation or related resources. Carrying capacity may vary from year to year on the same area due to fluctuating forage production.
CEQ	See Council of Environmental Quality.
CFR	See Code of Federal Regulations.
cfs	Cubic feet per second; a water flow measure
Chemical degradation	The breakdown of a chemical substance into simpler components through chemical reactions.
Chronic poisoning	Poisoning which occurs as a result of small, repeated doses of pesticide over a long period of time.
Chronic toxicity	The poisoning effects of a series of small doses applied over a long period.
Climax plant community	The final or stable biotic community in a developmental series.
Code of Federal Regulations (CFR)	The Code of Federal Regulations is a codification of the general and permanent rules published in the *Federal Register* by the executive departments and agencies of the Federal Government. The Code is divided into 50 titles that represent broad areas subject to Federal regulations. Each title is divided into chapters, which usually bear the name of the issuing agency. Each chapter is further subdivided into parts covering specific regulatory areas. The Code of Federal Regulations is kept up to date by the individual issues of the *Federal Register*. These two publications must be used together to determine the latest version of any given rule.

Collector roads — Roads constructed to serve two or more elements but which do not fit into the other two road categories (arterial or local). Construction costs of these facilities are prorated to the respective element served. These roads serve smaller land areas and are usually connected to a Forest arterial or public highway. They collect traffic from local Forest roads or terminal facilities. The location and standard are influenced by both long term multi-resource service needs and travel efficiency. Forest collector roads are operated for constant or intermittent service, depending on land use and resource management objectives for the area served by the facility.

Competition — The more or less active demand by 2 or more organisms or kinds of organisms at the same time for some environmental resource (such as sunlight, water, or other nutrients), in excess of the supply available, typically resulting in the ultimate eliminations of the less effective organism.

Concentration — The amount of active ingredient or acid equivalent in a given volume of liquid or in a given weight of dry material.

Contact herbicide — One that kills primarily by contact with plant tissue rather than as a result of translocation. Toxic upon contact with target or nontarget species.

Council on Environmental Quality (CEQ) — An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Critical habitat — The specific areas within the geographical areas occupied by the species, at the time it is listed in accordance with the Endangered Species Act, on which are found those physical or biological features that are essential to the conservation of the species and that may require special management considerations or protection. Also included are specific areas, outside the geographical area occupied by the species at the time it is listed, which the Secretary determines are essential for the conservation of the species.

Cultural resources — The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupations.

D

Degrade — To decompose or break up.

Dermal exposure — The contact of a chemical with skin.

Dermal toxicity — How poisonous a pesticide is to an animal when absorbed through the skin.

Developed recreation — Recreation that occurs where improvements enhance recreation opportunities and accommodate intensive recreation activities in a defined area.

Developed recreation sites Relatively small, distinctly defined area where facilities are provided for concentrated public use, i.e., campgrounds, picnic areas and swimming areas.

Diluent Any liquid or solid material that dilutes an active ingredient in the preparation of a formulation.

Dispersed recreation That portion of outdoor recreation use which occurs outside of developed sites in the unroaded and roaded Forest environment i.e., hunting, backpacking and berry picking.

Dormant Not actively growing.

Dormant spray Pesticide application made before trees and other plant life begin to leaf out in the spring.

Dosage rate Quantity of a toxicant applied per unit area. Usually expressed as oz. or lbs. active ingredient per acre.

Dose A given quantity of test material that is taken into the body; quantity of material to be administered.

Drift That portion of a sprayed chemical that is moved by wind off a target site.

Duff The layer of fresh to slightly decomposed organic matter and the less decomposed humus on a forest floor.

E

EA See environmental assessment.

Ecosystem A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake.)

Edaphic The influence of soils on living organisms, particularly plants, including man's use of the land for plant growth.

Emulsifiable Concentrate A liquid formulation obtained by dissolving the technical active ingredient in a liquid solvent and adding one or more emulsifiers, so that the formulated pesticide can be further diluted with water or oil for spray application.

Endangered species Any species in danger of extinction throughout all or a significant portion of its range that has been designated in the *Federal Register* as an endangered species.

Environmental analysis An analysis of alternative actions and their predictable short and long-term environmental effects which include physical, biological, economic, social, and environmental design factors and their interactions.

Environmental assessment (EA)	A concise public document that briefly provides sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or to return a finding of no significant impact, aids an agency's compliance with NEPA when no Environmental Impact Statement is necessary, or facilitates preparation of a statement when one is necessary.
Environmental fate	The transport, accumulation, and disappearance of an herbicide in the environment.
Environmental impact statement (EIS)	A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major Federal action.
EPA	U.S. Environmental Protection Agency.
Ephemeral stream	A stream that flows only in direct response to precipitation and whose channel is above the water table at all times.
Epidemiology	A science that deals with the incidence, distribution, and control of disease in a population.
Erosion	The group of processes whereby earth or rocky material is worn away by natural sources such as wind, water or ice and removed from any part of the earth's surface.
Ester	A compound formed by the reaction of an acid and an alcohol, generally accompanied by the elimination of water.
Evapotranspiration	The process that returns soil moisture to the atmosphere, including evaporation and plant transpiration (uptake of soil water through roots and loss of water through leaves or needles).
Exposure	The amount of contact with a substance.
Exposure analysis	The estimation of the amount of chemicals that organisms receive during the application of pesticides.

F

FDA	U.S. Food and Drug Administration.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	An act administered by EPA which requires that extensive toxicological studies be conducted on a pesticide in order to assess its potential hazard to humans and the environment.
Federal Register	A daily Federal publication that publishes regulations and legal notices that have been issued by Federal agencies.
Fetotoxic	Capable of producing adverse effects in a developing fetus.
FIFRA	See Federal Insecticide, Fungicide, and Rodenticide Act.

Forage	All browse and nonwoody plants available to livestock or wildlife for feed.
Forb	Any herbaceous plant other than true grasses, sedges or rushes.
Forest Service Handbook (FSH)	An internal set of detail procedural guidelines that implement the directives in the Forest Service Manual.
Forest Service Manual (FSM)	An internal set of operating directives that governs Forest Service activities.
Formulation	1) A pesticide preparation supplied by a manufacturer for practical use. (2) A manufacturing process by which technical active ingredients are prepared for practical use by mixing with liquid or dry diluents, grinding, or by the addition of emulsifiers, stabilizers, and other adjuvants.
FSM	See Forest Service Manual.
Fuel	Any substance or composite mixture that can ignite and burn.
FWS	Fish and Wildlife Service.

G

Grazing allotments	See Range Allotment.
Ground water	Water residing in the interstices of soil and rock below ground surface.

H

Habitat	The physical and biological environment of a plant or animal where all essentials for its development and existence are present.
Habitat type	An aggregation of all land areas potentially capable for producing similar plant communities at climax.
Half-life	The time required for half the amount of a substance (such as an herbicide) in or introduced into a living system to be eliminated, whether by excretion, metabolic decomposition, or other natural process.
Hazard	The risk of danger; the chance that danger or harm will come to the applicator, bystanders, consumers, livestock, wildlife, or crops, etc.
Hazard analysis	The determination of whether a particular chemical is or is not causally linked to particular harmful effects.
HDT	Highest dose tested.
Hectare (ha)	10,000 square meters, or approximately 2.47 acres.

Herbaceous	A plant that does not develop persistent woody tissue above the ground.
Herbicide	A chemical used to control, suppress, or kill plants, or to severely interrupt their normal growth processes.
Herbivore	An animal that exclusively eats plants.

I

Inactive	Will not react chemically with anything; not involved in the pesticide action.
Inert ingredients	All ingredients in a formulated pesticide product that are not classified as active ingredients. Note that inert as used here is a defined usage; many inert products are biologically active chemicals.
Infiltration	The downward entry of water into the soil.
Insectivorous	Referring to an animal that eats insects; in common usage, includes animals that eat insects and sometimes other selected invertebrates.
Integrated pest management (IPM)	A systematic decisionmaking process and the resultant management actions which derive from consideration of post--host systems and evaluation of alternatives for managing pest populations at levels consistent with resource management objectives.
Inter-disciplinary team (ID Team)	A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.
Intermittent stream	A stream that flows only at certain times of the year when it receives water from springs or from some surface source, such as melting snow.

K

Kilogram (kg)	One thousand grams, or approximately 2.2 pounds.

L

Label	All printed material on or attached to a pesticide container as required by law.
LC	Lethal concentration.

LC_{50} The median lethal concentration; the concentration of toxicant necessary to kill 50 percent of the organisms being tested. It is usually expressed in parts per million (ppm).

LD_{50} The median lethal dose; the size of a single dose of a chemical necessary to kill 50 percent of the organisms in a specific test situation. It is usually expressed in the weight of the chemical per unit of body weight (mg/kg). It may be fed (oral LD_{50}) or applied to the skin (dermal LD_{50}).

LDT Lowest dose tested.

Leach Usually refers to the movement of chemicals through soil by water; may also refer to the movement of herbicides out of leaves, stems, or roots into the air or soil.

Lethal Deadly toxic, that is, causing death of target or nontarget species.

M

Management Area An aggregation of capability areas which have common management direction and may be noncontiguous in the Forest. Consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issues and concerns.

MATC See maximum acceptable toxicant concentration.

Maximum acceptable toxicant concentration (MATC) The hypothetical toxic threshold concentration of a toxicant in water bounded by the highest tested concentration that has no significant adverse effect and the lowest concentration having a significant effect.

MBF Thousand Board Feet

Mesic Sites or habitats characterized by intermediate moisture conditions, i.e., neither decidedly wet (hydric, aquatic, or riparian) nor decidedly dry (xeric).

Metabolism The chemical changes in living cells by which energy is provided for vital processes and new material is assimilated.

Metabolite A product of the chemical changes in living cells that provides energy and assimilates new material.

mg See milligram.

mg/kg Milligrams per kilogram. Used to designate the amount of chemical received per kilogram of body weight of test organisms. 1 mg/kg = 1 ppm. 1 mg = 0.000035 ounce. 1 kg = 2.2 pounds.

mg/kg/day Milligrams per kilogram of body weight per day.

mg/l Milligrams per liter of solution.

Microbial degradation	The breakdown of a chemical substance into simpler components by bacteria.
Microgram (ug)	One-millionth of a gram.
Milligram (mg)	One-thousandth of a gram.
Mitigate	To cause to become less harsh or harmful.
Mitigation	Actions to avoid, minimize, reduce, eliminate, or rectify impacts.
ml	See milliliter.
MMBF	Million Board Feet
Mobility	The capability of an herbicide to be moved easily within soil, vertically or laterally, with the normal movement of water.
Mutagen	A substance that tends to increase the frequency or extent of genetic mutations.
Mutagenic	Capable of inducing a mutation. An agent (change in hereditary material) that tends to increase the occurrence or extent of mutation.
Mutagenicity	The capacity of a substance to cause changes in genetic material.
Mutation	A change in a gene potentially capable of being transmitted to offspring.

N

NAS	National Academy of Science.
NEPA	See National Environmental Policy Act.
NEPA process	All measures necessary for compliance with the requirements of Section 2 and Title I of NEPA.
NOEL	The no-observed-effect level. In a series of dose levels tested, it is the highest level at which no effect is observed; that is, safe in the species tested.
Neuropathy	Any disease affecting neurons, the fundamental functional unit of nervous tissues.
Neurotoxic	Toxic to nerves or nervous tissue.
Nongame	Species of animals which are not managed as a sport hunting resource.
Nonpersistent	Lasts only a short time (a few weeks or less) after being applied; breaks down rapidly in the environment.
Nonselective pesticide	A pesticide chemical that will control a wide range of pests.

Nontarget	Any plant, animal, or other organism that a pesticide application is not aimed at, but that may accidentally be injured by the chemical.
Nontarget vegetation	Vegetation which is not expected or not planned to be affected by the treatment.
Nonvolatile	A pesticide chemical that does not evaporate (turn into a gas or vapor) at normal temperatures.
No-observed-effect level (NOEL)	In a series of dose levels tested, it is the highest level at which no effect is observed.
Noxious weed	A plant regulated or identified by law or other official process as being undesirable, troublesome, and difficult to control. See page I-4 of this EIS for further definition.

O

Omnivorous	Eating both animal and vegetable substances.
Oncology	The branch of medicine that studies tumors.
Oncogenic (tumorigenic)	Capable of producing or inducing tumors in animals. The tumors may be either malignant (cancerous) or benign (noncancerous).
Organic material	An accumulation of decayed and resynthesized plant and animal residues with a high capacity for holding water and nutrients.
Overstory	That uppermost canopy of the forest when there is more than one level of vegetation.

P

ppm	See parts per million.
Parts per million (ppm)	The number of parts of the substance in question mixed per million parts of a carrier material. (1 ounce of salt in 62,500 pounds of sugar). One ppm = 1 mg/kg (on a weight basis) = 1 mg/liter (water or air).
Pathology	The study of the nature and cause of disease with respect to functional and structural changes.
Percolation	The flow of a liquid through a porous substance.
Perennial stream	A stream that flows continuously year round.

Persistence The resistance of an herbicide to metabolism and environmental degradation and thus an herbicides retention of its ability to kill plants for prolonged periods.

Pest An unwanted organism (animal, plant, bacteria, fungus, virus, etc.). See also "weed."

Pesticide Any substance or mixture of substances intended for controlling insects, rodents, fungi, weeds, or other forms of plant or animal life that are considered to be pests.

Photodecomposition The breakdown of a substance, especially a chemical compound, into simpler components by the action of radiant energy such as sunlight.

Phytotoxic Poisonous or harmful to plants.

Plan of operations A written plan describing mining and mineral processing activities that will likely cause a significant surface disturbance. The plan is prepared by those engaged in activities, such as prospecting, exploration or mining, in the National Forest. This plan must be approved by a Forest Officer.

Preemergent Applied prior to emergence of the specified weed or planted crop.

Prescribed fire A fire burning under specified conditions which will accomplish planned objectives in strict compliance with an approved plan and the conditions under which the burning takes place and the expected results are specific, predictable, and measurable.

Proposed action In terms of the National Environmental Policy Act, the project, activity, or action that a Federal agency intends to implement or undertake and which is the subject of an environmental analysis.

R

Range allotment A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.

Rangeland Any area on which the vegetation consists of native or introduced grasses, legumes, grasslike plants, forbs, or shrubs, and that is developed for range (grazing) use. Also counted as rangeland are native pastures or meadows that are occasionally cut or mechanically harvested and are grazed by livestock.

Raptors Birds of prey, such as owls, hawks, or eagles.

Rate The amount of active ingredient or acid equivalent applied per unit area or other treatment unit.

Record of decision A document separate from but associated with an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

Recovery plan An approved Fish & Wildlife Service plan that addresses recovery objectives for a plant or animal species listed as threatened or endangered.

Residue That quantity of herbicide, its degradation products, and/or its metabolites remaining on or in the soil, plant parts, animal tissues, whole organisms, and surfaces.

Right-of-way Land authorized to be used or occupied for the construction, operation, maintenance, and termination of a project facility passing over, upon, under, or through such land.

Riparian areas Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of the aquatic and riparian ecosystems, floodplains, and wetlands. They include all areas within a horizontal distance of 100 feet from the edge of perennial streams or other water bodies.

Riparian ecosystem A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water. (See further Hansen and others (1988).

Risk The probability that a substance will produce harm under specified conditions.

Risk analysis The description of the nature and often the magnitude of risk to organisms, including attendant uncertainty.

Road See arterial road, collector road, local road, skid road, and temporary road.

Runoff That part of precipitation, as well as any other flow contributions, that appears in surface streams, either perennially or intermittently.

S

Safety The reciprocal of risk, i.e., the probability that harm will not occur under specified conditions.

Safety factor A factor conventionally used to extrapolate human tolerances for chemical agents from no-observed-effect levels in animal test data.

Scoping process An early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to the proposed action. Identifying the significant environmental issues deserving of study and deemphasizing insignificant issues, narrowing the scope of the environmental impact statement accordingly. (Ref. CEQ regulations, 40 CFR 1510.7).

Sediment	Solid material, both mineral and organic, that is in suspension, being transported, or has been moved from its site of origin by air, water, gravity, or ice.
Sedimentation	The process or action of depositing sediment.
Selective pesticide, specific pesticide	A pesticide that will control only a few pest species and is not as poisonous to other plants and animals.
Sensitive species	Those species that have appeared in the *Federal Register* as proposed for classification for official listing as endangered or threatened species or that are on an official State list or are recognized by the Regional Forester to need special management to prevent them from becoming endangered or threatened.
Seral	A biotic community which is developmental; a transitory stage in an ecologic succession.
Shrub	A plant with persistent woody stems and relatively low growth form; usually produces several basal shoots as opposed to a single bole; differs from a tree ty its low status and nonarborescent form.
Silviculture	The art and science of growing and tending forest vegetation i.e., controlling the establishment, composition and growth of forests, for specific management goals.
Site preparation	A general term for a variety of activities that remove competing vegetation, slash, and other debris that may inhibit the reforestation effort.
Skid road	A travelway through the woods constructed by a bulldozer of similar equipment with a blade. A roadway on which logs can be skidded (dragged) and where multiple trips are made to transport trees from the stump to a landing.
Skid trails	A travelway through the wood formed by loggers dragging (skidding) logs from the stump to a log landing without dropping a blade and without purposefully changing the geometric configuration of the ground over which they travel.
Slash	The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.
Small game	Birds and small mammals normally hunted or trapped.
Species (plural: **species**)	A morphologically, genetically, and ecologically defined biological entity to which a binomial or "scientific name" is given; for example, *Centaurea maculosa*, is the binomial name for the species of knapweed commonly called "spotted knapweed.
Spot treatment	A herbicide applied over a small continuous restricted area of a whole unit; i.e., treatment of spots or patches or brush within a larger field.

Stand	An aggregation of trees or other growth occupying a specific area and sufficiently uniform in species composition, age, arrangement, and other conditions to be distinguishable from the forest, other growth, or other land cover on adjoining areas.
Subchronic toxicity	Effects of regularly repeated doses or exposures over periods ranging from a few days to several months.
Succession	The gradual supplanting of one community of plants by another.
Surface water	Rivers, lakes, ponds, streams, and so forth, that are located above ground.
Surfactant	A material that improves the emulsifying, dispersing, spreading, wetting, or other surface-modifying properties of liquids.
Susceptible	Can be killed or injured by the pesticide at the rate used.
Suspended sediment	Sediment suspended in a fluid by the upward components of turbulent currents or by colloidal suspension.
Symptom	A warning that something is wrong. An outward signal of a disease or poisoning in a plant, animal, or human.
Synecology	The branch of ecology that studies the interrelationships among *communities of organisms*.
Synergism	The harmonious action of two agents, producing an effect that neither could produce alone or an effect that is greater than the total effects of each agent operating by itself.
Systemic herbicide	An herbicide that is moved within the plant. In a more restricted sense, refers to herbicides that are applied to foliage and move downward through living tissue to underground parts.
Systemic toxicity	Effects produced as a result of the distribution of a poison or foreign substance from the point of exposure to a distant site within the body.

T

Target	The area, buildings, plants, animals, or pests intended to be treated with a pesticide application.
Technical material or pesticide	The pesticide as it is first manufactured by the company before formulation. It is usually almost pure.
Temporary road	Those roads needed only for the purchaser or permittee's use. The forest Service and the purchaser or permittee must agree to the location and clearing widths. Temporary roads are used for a single, short-term use, e.g., to haul timber from landings to Forest development roads, access to build water developments, etc.

Teratogen	Any substance capable of producing structural abnormalities of prenatal origin, present at birth or manifested shortly thereafter (the ability to produce birth defects).
Teratogenic	Capable of producing or inciting the development of malformations in an embryo.
Test animals	Laboratory animals, usually rats, fish, birds, mice, or rabbits, used to determine the toxicity and hazards of different pesticides.
Threatened species	Any plant or animal species that is likely to become an endangered species within the foreseeable future in all or a significant portion of its range. The species are designated in the *Federal Register* as threatened species.
Threshold	A dose or exposure below which there is no apparent or measurable adverse effect.
Threshold limit value (TLV)	The concentration of an airborne constituent to which workers may be exposed repeatedly, day by day, without adverse effect.
Tiering	Refers to the elimination of repetitive discussions of the same issue by incorporating by reference the general discussion in an environmental impact statement of broader scope. For example, a project environmental assessment could be tiered to the Forest Plan EIS.
TLV	See threshold limit value.
Tolerance	The amount of a pesticide that can remain on any food (plant or animal) that is to be eaten by livestock or humans. The tolerance is set by the EPA.
Tolerant	Not susceptible to (injured by) a pesticide application.
Topography	The configuration of land surface including its relief, elevation, and the position of its natural and manmade figures.
Toxic	Poisonous, but not necessarily fatal.
Toxicity	The capacity or property of a substance to cause any adverse effects. It is based on scientifically verifiable data from animal or human exposure tests.
Toxicology	The science dealing with the study of the adverse biological effects of chemicals.
Trade name	A brand name. The name given to a pesticide by a manufacturing company to identify it as their product.
Trailhead	The parking, signing, and other facilities available at the terminus of a trail.
Transitory range	Land that is suitable for grazing use for a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time before being replaced by trees or shrubs not suitable for forage.
Translocated herbicide	One that is moved within the plant from the point of entry.

Translocation — The transfer of substances from one location to another in the plant body.

Transpiration — The process by which plants take up moisture from the soil through their root systems and give off moisture to the air through their leaves (needles).

Treated area — A field, forest, roadside, or other place where a weed control method is applied.

Tumor — A new growth of tissue that forms an abnormal mass and performs no physiologic function. It usually develops independently of and unrestrained by the normal principles of biological growth.

U

ug — See microgram.

Understory — The trees and other woody species which grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

USDA — U.S. Department of Agriculture.

V

Vapor pressure — The pressure at which a chemical compound will evaporate.

Visual resource — The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Volatile — A compound is volatile when it evaporates or vaporizes (changes from a liquid to a gas) at ordinary temperatures on exposure to air.

Volatility — The quality of evaporating readily at normal temperatures and pressures.

W

Water table — The upper limit of the part of the soil or underlying rock material that is wholly saturated with water.

Weed — A plant growing where it is not desired.

X

Xeric Sites or habitats characterized by decidedly dry conditions.

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APPENDIX A – Statutes

Appendix A.

STATUTES

This chapter contains the full text of the following Federal and State of Montana statutes and rules:

CARLSON-FOLEY ACT †

PUBLIC LAW 90–583; 82 STAT. 1146

[S. 2671]

An Act to provide for the control of noxious plants on land under the control or jurisdiction of the Federal Government

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That:

The heads of Federal departments or agencies are authorized and directed to permit the commissioner of agriculture or other proper agency head of any State in which there is in effect a program for the control of noxious plants to enter upon any lands under their control or jurisdiction and destroy noxious plants growing on such land if—

(1) such entry is in accordance with a program submitted to and approved by such department or agency: *Provided*, That no entry shall occur when the head of such Federal department or agency, or his designee, shall have certified that entry is inconsistent with national security;

(2) the means by which noxious plants are destroyed are acceptable to the head of such department or agency; and

(3) the same procedure required by the State program with respect to privately owned land has been followed.

Sec. 2. Any State incurring expenses pursuant to section 1 of this Act upon presentation of an itemized account of such expenses shall be reimbursed by the head of the department or agency having control or jurisdiction of the land with respect to which such expenses were incurred: *Provided*, That such reimbursement shall be only to the extent that funds appropriated specifically to carry out the purposes of this Act are available therefor during the fiscal year in which the expenses are incurred.

Sec. 3. There are hereby authorized to be appropriated to departments or agencies of the Federal Government such sums as the Congress may determine to be necessary to carry out the purposes of this Act.

Approved October 17, 1968.

FEDERAL NOXIOUS WEED ACT OF 1974 †

PUBLIC LAW 93–629; 88 STAT. 2148

[H. R. 11273]

An Act to provide for the control and eradication of noxious weeds, and the regulation of the movement in interstate or foreign commerce of noxious weeds and potential carriers thereof, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That:

This Act may be cited as the "Federal Noxious Weed Act of 1974".

Sec. 2. The importation or distribution in interstate commerce of noxious weeds, except under controlled conditions, allows the growth and spread of such weeds which interfere with the growth of useful plants, clog waterways and interfere with navigation, cause disease, or have other adverse effects upon man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health. The uncontrolled distribution with-

in the United States of noxious weeds after their importation or interstate distribution has like detrimental effects and allowing such distribution encourages and facilitates the burdening and obstructing of interstate and foreign commerce, and is inimical to the public interest. Accordingly, the Congress hereby determines that the regulation of transactions in, and movement of, noxious weeds as provided in this Act is necessary to prevent and eliminate burdens upon and obstructions to interstate and foreign commerce and to protect the public welfare.

Sec. 3. As used in this Act, except where the context otherwise requires:

(a) "Secretary" means the Secretary of Agriculture of the United States or any other person to whom authority may be delegated to act in his stead.

(b) "Authorized inspector" means any employee of the Department of Agriculture, or any employee of any other agency of the Federal Government or of any State or other governmental agency which is cooperating with the Department in administration of any provisions of this Act, who is authorized by the Secretary to perform assigned duties under this Act.

(c) "Noxious weed" means any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish or wildlife resources of the United States or the public health.

(d) "United States" means any of the States, territories, or districts of the United States.

(e) "Interstate" means from any State, territory, or district of the United States into or through any other State, territory, or district.

(f) "District" means the District of Columbia, the Commonwealth of Puerto Rico, or any possession of the United States.

(g) "Move" means deposit for transmission in the mails, ship, offer for shipment, offer for entry, import, receive for transportation, carry, or otherwise transport or move, or allow to be moved, by mail or otherwise.

Sec. 4. (a) No person shall knowingly move any noxious weed, identified in a regulation promulgated by the Secretary, into or through the United States or interstate, unless such movement is authorized under general or specific permit from the Secretary and is made in accordance with such conditions as the Secretary may prescribe in the permit and in such regulations as he may promulgate under this Act to prevent the dissemination into the United States, or interstate, of such noxious weeds.

(b) The Secretary may refuse to issue a permit for the movement of any such noxious weed when, in his opinion, such movement would involve a danger of dissemination of such noxious weeds into the United States or interstate.

(c) No person shall knowingly sell, purchase, barter, exchange, give, or receive any such noxious weed which has been moved in violation of subsection (a), or knowingly deliver or receive for transportation or transport, in interstate or foreign commerce, any advertisement to sell, puchase,[1] barter, exchange, give, or receive any such noxious weed which is prohibited from movement in such commerce under this Act.

Sec. 5. (a) The Secretary may promulgate such quarantines and other regulations requiring inspection of products and articles of any character whatsoever and means of conveyance, specified in the regulations, as a condition of their movement into or through the United States and otherwise restricting or prohibiting such movement, as he deems necessary to prevent the dissemination into the United States of any noxious weeds, and it shall be unlawful for any person to move any products, articles, or means of conveyance into or through the United States contrary to any such regulation.

(b) Whenever the Secretary has reason to believe that an infestation of noxious weeds exists in any State, territory, or district, he may by regulation temporarily quarantine such jurisdiction, or a portion thereof, and by regulation may restrict or prohibit the interstate movement from the quarantined area of any products and articles of any character whatsoever and means of conveyance, capable of carrying such noxious weeds, and after promulgation of such quarantine and other regulations, it shall be unlawful for any person to move interstate from a quarantined area any such products, articles, or means of conveyance, specified in the regulations, except in accordance with such regulations: *Provided, however*, That such quarantine and regulations shall expire at the close of the ninetieth day after their promulgation.

(c) However, if, after public hearing, the Secretary determines, on the basis of the information received at the hearing and other information available to him, that such a quarantine and regulations are necessary in order to prevent the interstate spread of noxious weeds from any State, territory, or district in which he determines an infestation of noxious weeds exists, and to protect the agriculture, commerce, fish, or wildlife resources of the United States or the public health, he shall promulgate such quarantine and other regulations as he determines are appropriate for such purposes, and thereafter it shall be unlawful for any person to move interstate from any quarantined area any regulated products, articles, or means of conveyance except in accordance with such regulations.

Sec. 6. (a) Except as provided in paragraph (c) of this section, the Secretary may, whenever he deems it necessary as an emergency measure in order to prevent the dissemination of any noxious weed, seize, quarantine, treat, destroy, or otherwise dispose of, in such manner as he deems appropriate, any product or article of any character whatsoever, or means of conveyance, which is moving into or through the United States or interstate, in bond or otherwise, and which he has reason to believe is infested by any noxious weed or contains any such weed, or which has moved into the United States,

1. So in original. Probably should read "purchase".

or interstate, and which he has reason to believe was infested by or contained any noxious weed at the time of such movement; and any noxious weed, product, article, or means of conveyance which is moving into or through the United States, or interstate, or has moved into the United States, or interstate, in violation of this Act or any regulation hereunder.

(b) Except as provided in subsection (c) of this section, the Secretary may order the owner of any product, article, means of conveyance, or noxious weed subject to disposal under subsection (a) of this section, or his agent, to treat, destroy, or make other disposal of such product, article, means of conveyance, or noxious weed, without cost to the Federal Government and in such manner as the Secretary deems appropriate. The Secretary may apply to the United States District Court, or to the United States court of any territory or possession, for the judicial district in which such person resides or transacts business or in which the product, article, means of conveyance, or noxious weed is found, for enforcement of such order by injunction, mandatory or otherwise. Process in any such case may be served in any judicial district wherein the defendant resides or transacts business or may be found, and subpenas for witnesses who are required to attend a court in any judicial district in such a case may run to any other judicial district.

(c) No product, article, means of conveyance, or noxious weed shall be destroyed, exported, or returned to shipping point of origin, or ordered to be destroyed, exported, or so returned under this section, unless in the opinion of the Secretary there is no less drastic action which would be adequate to prevent the dissemination of noxious weeds into the United States or interstate.

(d) The owner of any product, article, means of conveyance, or noxious weed destroyed, or otherwise disposed of, by the Secretary under this section, may bring an action against the United States in the United States District Court for the District of Columbia, within one year after such destruction or disposal, and recover just compensation for such destruction or disposal of such product, article, means of conveyance, or noxious weed (not including compensation for loss due to delays incident to determining its eligibility for movement under this Act) if the owner establishes that such destruction or disposal was not authorized under this Act. Any judgment rendered in favor of such owner shall be paid out of the money in the Treasury appropriated for administration of this Act.

Sec. 7. Any authorized inspector, when properly identified, shall have authority (a) without a warrant, to stop any person or means of conveyance moving into the United States, and inspect any noxious weeds and any products and articles of any character whatsoever, carried thereby, and inspect such means of conveyance, to determine whether such person or means of conveyance is moving any noxious weed, product, article, or means of conveyance contrary to this Act or any regulation under this Act; (b) without a warrant, to stop any person or means of conveyance moving through the United States or interstate, and inspect any noxious weeds and any products and

articles of any character whatsoever carried thereby, and inspect such means of conveyance, to determine whether such person or means of conveyance is moving any noxious weed, product, article, or means of conveyance contrary to this Act or any regulation thereunder, if such inspector has probable cause to believe that such person or means of conveyance is moving any noxious weed regulated under this Act; and (c) to enter, with a warrant, any premises in the United States, for purposes of any inspections or other actions necessary under this Act. Any judge of the United States or of a court of record of any State, territory, or district, or a United States commissioner, may, within his respective jurisdiction, upon proper oath or affirmation showing probable cause to believe that there are on certain premises any products, articles, means of conveyance, or noxious weeds subject to this Act, issue warrants for the entry of such premises for purposes of any inspection or other action necessary under this Act, except as otherwise provided in section 9 of this Act. Such warrants may be executed by any authorized inspector or any United States marshal.

Sec. 8. Any person who knowingly violates section 4 or 5 of this Act, or any regulation promulgated under this Act, shall be guilty of a misdemeanor and shall be punished by a fine not exceeding $5,000, or by imprisonment not exceeding one year, or both.

Sec. 9. (a) The Secretary is authorized to cooperate with other Federal agencies, agencies of States, territories, or districts, or political subdivisions thereof, farmers' associations, and similar organizations, and individuals in carrying out operations or measures in the United States to eradicate, suppress, control, or prevent or retard the spread of any noxious weed. The Secretary is authorized to appoint employees of other agencies of the Federal Government or any agencies of any State, territory, or district, or political subdivisions thereof, as collaborators to assist in administration of the provisions of this Act, pursuant to cooperative agreements with such agencies, whenever he determines that such appointments would facilitate administration of this Act.

(b) In performing the operations or measures authorized by subsection (a) of this section, the cooperating State or other governmental agency shall be responsible for the authority necessary to carry out the operations or measures on all lands and properties within the State or other jurisdiction involved, other than those owned or controlled by the United States Government, and for such other facilities and means as in the discretion of the Secretary are necessary.

Sec. 10. The Secretary is authorized to promulgate regulations necessary to effectuate the provisions of this Act. However, any regulation identifying a noxious weed under section 4 of this Act shall be promulgated only after publication of a notice of the proposed regulation and, when requested by any interested person, a public hearing on the proposal. Any such regulation shall be based upon the information received at any such hearing and other information available to the Secretary and a determination by the Sec-

retary that the plant is within the definition of a noxious weed in section 3(c) of this Act and that its dissemination in the United States may reasonably be expected to have, to a serious degree, any effect specified in section 3(c).

Sec. 11. There are hereby authorized to be appropriated such sums as Congress may from time to time determine to be necessary for the administration of this Act. Any sums so appropriated shall be available for expenditures for the purchase, hire, maintenance, operation, and exchange of aircraft and other means of conveyance, and for such other expenses as may be necessary to carry out the purposes of this Act. However, unless specifically authorized in other legislation or provided for in appropriations, no part of such sums shall be used to pay the cost or value of property injured or destroyed under section 9 of this Act.

Sec. 12. The provisions of this Act shall not apply to shipments of seed subject to the Federal Seed Act (53 Stat. 1275, as amended; 7 U.S.C. 1551 et seq.) and this Act shall not amend or repeal any of the provisions of said Act or of the Plant Quarantine Act of August 20, 1912 (37 Stat. 315, as amended; 7 U.S.C. 151–154, 156–164a, 167), the Federal Plant Pest Act (71 Stat. 31; 7 U.S.C. 150aa–150jj), or any other Federal laws.

Sec. 13. The provisions of this Act shall not invalidate the provisions of the laws of any State or political subdivision thereof, or of any territory or district of the United States relating to noxious weeds, except that no such jurisdiction may permit any action that is prohibited under this Act.

Sec. 14. If any provision of this Act or the application thereof to any person or circumstances is held invalid, the remainder of the Act and the application of such provision to other persons and circumstances shall not be affected thereby.

Approved Jan. 3, 1975.

MONTANA COUNTY NOXIOUS WEED CONTROL ACT

Title 7, Chapter 22
Sections
7-22-2101 through 7-22-2153

COUNTY NOXIOUS WEED CONTROL ACT

7-22-2101. Definitions. As used in this part, unless the context indicates otherwise, the following definitions apply:

(1) "Board" means a district weed board created under 7-22-2103.

(2) "Commissioners" means the board of county commissioners.

(3) "Department" means the department of agriculture provided for in 2-15-3001.

(4) "District" means a weed management district organized under 7-22-2102.

(5) (a) "Noxious weeds" or "weeds" means any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses and which is designated:

(i) as a statewide noxious weed by rule of the department; or

(ii) as a district noxious weed by a board, following public notice of intent and a public hearing.

(b) A weed designated by rule of the department as a statewide noxious weed must be considered noxious in every district of the state.

(6) "Person" means an individual, partnership, corporation, association, or state or local government agency or subdivision owning, occupying, or controlling any land, easement, or right-of-way, including any county, state, or federally owned and controlled highway, drainage or irrigation ditch, spoil bank, borrow pit, or right-of-way for a canal or lateral.

(7) "Supervisor" means the person employed by the board to conduct the district noxious weed management program and supervise other district employees.

(8) "Weed management" or "control" means the planning and implementation of a coordinated program for the containment, suppression, and, where possible, eradication of noxious weeds.

7-22-2102. Weed management districts established. A weed management district shall be formed in every county of this state and shall include all the land within the boundaries of the county, except that a weed management district may include more than one county through agreement of the commissioners of the affected counties.

7-22-2103. District weed board. (1) The commissioners shall appoint a district weed board consisting of three or five members, and:

(a) if a three-member board, two members shall be rural agricultural landowners within the district and one shall be a member-at-large; or

(b) if a five-member board, three members shall be rural agricultural landowners within the district, one member shall be a resident of a city or town within the district, and one shall be a member-at-large.

(2) The county extension agent in each county and other interested individuals may be appointed to serve as nonvoting members of that district's weed board.

(3) The board members are public officers.

7-22-2104. Term of office. (1) Except as provided in subsection (2), a member of a district weed board serves a term of 3 years and until the qualification of his successor. The term of office begins January 1.

(2) When a three-member weed board is established, the initial board members serve terms of 1, 2, and 3 years, respectively, as designated by the commissioners. When a five-member weed board is established, two of the initial members serve terms of 1 year, two serve terms of 2 years, and one serves a term of 3 years. After expiration of an initial term of office, the successor serves a 3-year term as provided in subsection (1).

7-22-2105. Organization of district weed board and compensation. (1) The board shall organize by choosing a chairman and a secretary. The secretary may or may not be a member of the board.

(2) Salary, per diem, and mileage of such board members shall be set by resolution of the commissioners.

(3) A majority of the board constitutes a quorum for the conduct of business.

7-22-2106. Renumbered 7-22-2115 by Code Commissioner, 1985.

7-22-2107. Renumbered 7-22-2116 by Code Commissioner, 1985.

7-22-2108. Renumbered 7-22-2117 by Code Commissioner, 1985.

7-22-2109. Powers and duties of board. (1) The board may:

(a) employ a supervisor and other employees as necessary and provide for their compensation;

(b) purchase such chemicals, materials, and equipment and pay other operational costs as it determines necessary for implementing an effective weed management program. Such costs must be paid from the noxious weed fund.

(c) determine what chemicals, materials, or equipment may be made available to persons controlling weeds on their own land. The cost for such chemicals, materials, or equipment must be paid by such person and collected as provided in this part.

(d) enter into agreements with the department for the control and eradication of any new exotic plant species not previously established in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial use if such plant species spreads or threatens to spread into the state; and

(e) perform other activities relating to weed management.

(2) The board shall:

(a) administer the district's noxious weed program;

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(b) establish management criteria for noxious weeds on all land within the district;

(c) make all reasonable efforts to develop and implement a noxious weed program covering all land within the district owned or administered by a federal agency.

7-22-2110. Administrative hearing -- appeals. (1) A person adversely affected by any notice, action, or order of the board may request an administrative hearing before the board. The board shall hold a hearing within 30 days of the request. Participants may be represented by legal counsel. The board shall make a record of the proceeding and enter its order and findings within 7 days after the hearing.

(2) An order of the board may be appealed to the commissioners within 30 days from the time the order is entered. The commissioners shall hear such appeal within 30 days after the notice of appeal and shall render their order and findings within 7 days after such hearing. Participants may be represented by legal counsel.

(3) Within 30 days after the commissioners render their order and findings, the person adversely affected may file a petition in district court requesting that the order and findings of the commissioners be set aside or modified. The court may affirm, modify, or set aside the order complained of, in whole or in part.

7-22-2111 through 7-22-2114 reserved.

7-22-2115. Noxious weeds and seeds declared nuisance. Noxious weeds and the seed of any noxious weed are hereby declared a common nuisance.

7-22-2116. Unlawful to permit noxious weeds to propagate. It is unlawful for any person to permit any noxious weed to propagate or go to seed on his land, except that any person who adheres to the noxious weed management program of his district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section.

7-22-2117. Violations. (1) Any person who in any manner interferes with the board or its authorized agent in carrying out the provisions of this part or who refuses to obey an order or notice of the board is guilty of a misdemeanor, and upon conviction thereof, he shall be fined not to exceed $100 for the first offense and not less than $100 or more than $200 for each subsequent offense.

(2) All fines, bonds, and penalties collected under the provisions of this part shall be paid to the county treasurer of each county and placed by him to the credit of a fund to be known as the noxious weed fund.

7-22-2118 through 7-22-2120 reserved.

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7-22-2121. Weed management program. (1) The noxious weed management program must be based on a plan approved by the board.

(2) The noxious weed management plan must:

(a) specify the goals and priorities of the program;

(b) review the distribution and abundance of each noxious weed species known to occur within the district and specify the locations of new infestations and areas particularly susceptible to new infestations; and

(c) estimate the personnel, operations, and equipment costs of the proposed program.

(3) The board shall provide for the management of noxious weeds on all land or rights-of-way owned or controlled by a county or municipality within the confines of the district. It shall take particular precautions while managing the noxious weeds to preserve beneficial vegetation and wildlife habitat. Where at all possible, methods for such control shall include cultural, chemical, and biological methods.

(4) The board may establish special management zones within the district. The management criteria in such zones may be more or less stringent than the general management criteria for the district.

7-22-2122 Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2123. Procedure in a case of noncompliance. (1) Where complaint has been made or the board has reason to believe that noxious weeds described in this part are present upon a person's land within the district in violation of the law, that person must be notified by mail or telephone of the complaint and the board may request inspection of such land. The board or its authorized agent and the landowner or his representative shall inspect the land at an agreeable time, within 10 days of notification of the landowner. If after reasonable effort the board is unable to gain cooperation of the person, the board or its authorized agent may enter and inspect the land to determine if the complaint is valid.

(2) If noxious weeds are found, the board or supervisor shall notify the person or his representative and seek voluntary compliance with the district weed control program. If voluntary compliance is not possible, notice of noncompliance must be sent to the person by certified mail.

(3) The notice must specify:

(a) the basis for the determination of noncompliance;

(b) the geographic location of the area of noncompliance, by legal description or other reasonably identifiable description;

(c) measures to be undertaken in order to comply with the district's management criteria; and

(d) a reasonable period of time, not less than 10 days, in which compliance measures must be initiated.

(4) A person is considered in compliance if he submits and the board accepts a proposal to undertake specified control measures and is in compliance for so long as he performs according to the terms of the proposal. If the measures proposed

to be taken extend beyond the current growing season, the proposal and acceptance must be in writing.

(5) In accepting or rejecting a proposal, the board shall consider the economic impact on the person and his neighbors, practical biological and environmental limitations, and alternative control methods to be used.

7-22-2124. Destruction of weeds by board. (1) If corrective action is not taken and no proposal is made and accepted within the time specified in the notice, the board may forthwith enter upon the person's land and institute appropriate control measures.

In such case the board shall submit a bill to the person, itemizing man-hours of labor, material, and equipment time, together with a penalty not exceeding 10% of the total cost incurred. Labor and equipment must be valued at the current rate paid for commercial management operations in the district. The bill must specify and order a payment due date of 30 days from the date the bill is sent.

(2) A copy of the bill must also be submitted by the board to the county clerk and recorder.

7-22-2125 Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2126. Embargo. The board may establish voluntary embargo programs to reduce the spread of noxious weeds within the district or the introduction of noxious weeds into the district.

7-22-2127 Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2128 through 7-22-2140 reserved.

7-22-2141. Noxious weed fund authorized. (1) The commissioners of each county in this state shall create a noxious weed management fund, to be designated the "noxious weed fund".

(2) This fund shall be kept separate and distinct by the county treasurer.

7-22-2142. Sources of money for noxious weed fund. (1) The commissioners may create the noxious weed fund by:

(a) appropriating money from the general fund of the county;

(b) at any time fixed by law for levy and assessment of taxes, levying a tax not exceeding 2 mills on the dollar of total taxable valuation in such county; and

(c) levying a tax in excess of 2 mills if authorized by a majority of the qualified electors voting in an election held for this purpose pursuant to 7-6-2531 through 7-6-2536.

(2) The proceeds of the tax shall be used solely for the purpose of managing noxious weeds in said county and shall be designated to the noxious weed fund.

(3) Any proceeds from work or chemical sales shall revert to the noxious weed fund and shall be available for reuse within that fiscal year or any subsequent year.

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(4) The commissioners may accept any private, state, or federal gifts, grants, contracts, or other funds to aid in the management of noxious weeds within the district. These funds must be placed in the noxious weed fund.

7-22-2143. Determination of cost of weed control program. The commissioners shall determine and fix the cost of the control of noxious weeds in the district, whether the same be performed by the individual landowners or by the board.

7-22-2144. Payment of cost of weed control program. The total cost of such control shall be paid from the noxious weed fund. The cost of controlling such weeds growing along the right-of-way of a state or federal highway shall, upon the presentation by the board of a verified account of the expenses incurred, be paid from the state highway fund in compliance with 7-14-2132 and any agreement between the board and the department of highways. Costs attributed to other lands within the district shall be assessed to and collected from the responsible person as set forth in 7-22-2116.

7-22-2145. Expenditures from noxious weed fund. (1) The noxious weed fund shall be expended by the commissioners at such time and in such manner as is deemed best by the board to secure the control of noxious weeds.

(2) Warrants upon such fund shall be drawn by the board. No warrants shall be drawn except upon claims duly itemized by the claimant, except payroll claims which shall be itemized and certified by the board, and each such claim shall be presented to the commissioners for approval before the warrant therefor shall be countersigned by the commissioners.

7-22-2146. Financial assistance to persons responsible for weed control. (1) The commissioners, upon recommendation of the board, may establish cost-share programs with any person, specifying costs that may be paid from the noxious weed fund and costs that must be paid by the person. Cost-share programs may be established for special projects and for established management zones.

(2) (a) When under the terms of any voluntary agreement, whether entered into pursuant to 7-22-2123 or otherwise, or under any cost-share program entered pursuant to this section a person incurs any obligation for materials or services provided by the board, the board shall submit a bill to the person, itemizing man-hours of labor, material, and equipment time. The bill must specify and order a payment due date not less than 30 days from the date the bill is sent.

(b) A copy of the bill must be submitted by the board to the county clerk and recorder. If the sum to be repaid by the person billed is not repaid on or before the date due, the county clerk and recorder shall certify the amount thereof, with the description of the land to be charged, and shall enter the sum on the assessment list as a special tax on the land, to be collected in the manner provided in 7-22-2148.

7-22-2147 Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2148. Tax liability for payment of weed control expenses. (1) The expenses referred to in 7-22-2124 shall be paid by the county out of the noxious weed fund, and unless the sum to be repaid by the person billed under 7-22-2124 is repaid on or before the date due, the county clerk shall certify the amount thereof, with the description of the land to be charged, and shall enter the same on the assessment list of the county as a special tax on the land. If the land for any reason is exempt from general taxation, the amount of such charge may be recovered by direct claim against the lessee and collected in the same manner as personal taxes. When such charges are collected, they shall be credited to the noxious weed fund.

(2) In determining what lands are included as land covered by the special tax and are described in the certificate of the county clerk, it is presumed that all work done upon any of the land of any one landowner is for the benefit of all of the land within the district belonging to such landowner which was contiguous to or joined the parcel upon which the work was done at the time the work was done, together with the parcel upon which the work was done, and the amount certified becomes a tax upon the whole thereof.

7-22-2149. Responsibility for assessments and taxes for weed control levied on leased state lands. The lessee of agricultural state land is responsible for assessments and taxes levied by the board of county commissioners for the district as provided in 77-6-114.

7-22-2150. Cooperation with state and federal-aid programs. The board is empowered to cooperate with any state or federal-aid program that becomes available. Under such a plan of cooperation, the direction of the program shall be under the direct supervision of the board of the district in which the program operates.

7-22-2151. Cooperative agreements. (1) Any state agency controlling land within a district, including the department of highways; the department of state lands; the department of fish, wildlife, and parks; the department of institutions; the department of natural resources and conservation; and the university system, shall enter into a written agreement with the board. The agreement must specify mutual responsibilities for noxious weed management on state-owned or state-controlled land within the district.

(2) The board and the governing body of each incorporated municipality within the district shall enter into a written agreement and shall cooperatively plan for the management of noxious weeds within the boundaries of the municipality. The board may implement management procedures described in the plan within the boundaries of the municipality for noxious weeds only. Control of nuisance weeds within the municipality remains the

responsibility of the governing body of the municipality, as specified in 7-22-4101.

(3) A board may develop and carry out its noxious weed management program in cooperation with boards of other districts, with state and federal governments and their agencies, or with any person within the district. The board may enter into cooperative agreements with any of these parties.

7-22-2152. Revegetation of rights-of-way and disturbed areas. (1) Any state agency or local government unit approving a mine, major facility, transmission line, solid waste facility, highway, subdivision, or any other development resulting in significant disturbance of land within a district shall notify the board.

(2) Whenever any person or agency disturbs vegetation on an easement or right-of-way within a district by construction of a road, irrigation or drainage ditch, pipeline, transmission line, or other development, the board shall require that the disturbed areas be seeded, planted, or otherwise managed to reestablish a cover of beneficial plants.

(3) (a) The person or agency disturbing the land shall submit to the board a written plan specifying the methods to be used to accomplish revegetation. The plan must describe the time and method of seeding, fertilization practices, recommended plant species, use of weed-free seed, and the weed management procedures to be used.

(b) The plan is subject to approval by the board, which may require revisions to bring the revegetation plan into compliance with the district weed management plan. Upon approval by the board, the revegetation plan must be signed by the chairman of the board and the person or agency responsible for the disturbance and constitutes a binding agreement between the board and such person or agency.

7-22-2153. Voluntary agreements for control of noxious weeds along roads. (1) Any person may voluntarily seek to enter into an agreement for the management of noxious weeds along a state or county highway or road bordering or running through his land. The supervisor may draft such an agreement upon the request of and in cooperation with the person; however, the agreement must, in the board's judgment, provide for effective weed management. The weed management agreement must be signed by the person and, upon approval of the board, by the chairman. An agreement involving a state highway right-of-way must also be signed by a representative of the department of highways.

(2) The agreement must contain a statement disclaiming any liability of the board and, if applicable, the department of highways for any injuries or losses suffered by the person in managing noxious weeds on the state or county highway right-of-way. The signed agreement transfers responsibility for managing noxious weeds on the specified section of right-of-way from the board to the person signing the agreement. If the board later finds that the person has failed to adhere to the agreement, the board shall issue an order informing the person

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that the agreement will be void and that responsibility for the management of noxious weeds on the right-of-way will revert to the board unless the person complies with the provisions of the agreement within a specified time period.

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MONTANA COUNTY NOXIOUS WEED CONTROL

Administrative Rules

4.5.201 through 4.5.203

COUNTY NOXIOUS WEED LIST

Sub-Chapter 2

Designation of Noxious Weeds

4.5.201 DESIGNATION OF NOXIOUS WEEDS (1) The department designates certain exotic plants listed in these rules as statewide noxious weeds under the County Weed Control Act 7-22-2101 (5), MCA. All counties must implement management standards for these noxious weeds consistent with weed management criteria developed under 7-22-2109 (2) (b) of the Act. The department established two categories of the noxious weeds. (History: Sec. 7-22-2101 MCA; IMP, Sec. 7-22-2101 MCA; NEW 1986, p. 337, Eff. 3/14/86.)

4.5.202 CATEGORY 1 (1) Category 1 noxious weeds are weeds that are currently established in many counties of the state. Management criteria for control of these weeds is necessary in all counties to contain or suppress existing infestations or to prevent, through eradication or other appropriate measures, new infestations of these weeds. All of these weeds render land unfit or greatly limit the beneficial uses.

(2) The following are designated as category 1 noxious weeds:

(a) Canada Thistle (*Cirsium arvense*)
(b) Field Bindweed (*Convolvulus arvensis*)
(c) Whitetop (*Cardaria draba*)
(d) Leafy Spurge (*Euphorbia esula*)
(e) Russian Knapweed (*Centaurea repens*)
(f) Spotted Knapweed (*Centaurea maculosa*)
(g) Diffuse Knapweed (*Centaurea diffusa*)
(h) Dalmation Toadflax (*Linaria dalmatica*)
(i) St. Johnswort (*Hypericum perforatum*). (History: Sec. 7-22-2101 MCA; IMP, Sec. 7-22-2101 MCA; NEW 1986, p. 337, Eff. 3/14/86.)

4.5.203 CATEGORY 2 (1) Category 2 noxious weeds are weeds that have not been detected in the State of Montana or have recently been introduced into the State of Montana. These weeds have the potential for rapid spread and invasion of lands, thereby rendering them unfit for beneficial uses. County planning to prevent the spread or introduction of these weeds is necessary. Management criteria for detection and immediate action to eradicate or contain these weeds is necessary in all counties.

(2) The following are designated as category 2 noxious weeds:

(a) Dyers Woad (*Isatis tinctoria*)
(b) Yellow Starthistle (*Centaurea solstitialis*)
(c) Common Crupina (*Crupina vulgaris*)
(d) Tansy Ragwort (*Senecio jacobaea*)
(e) Rush Skeletonweed (*Chondrilla juncea*). (History: Sec. 7-22-2101 MCA; IMP, Sec. 7-22-2101 MCA; NEW 1986, p. 337, Eff. 3/14/86.)

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APPENDIX B – County Weed Board Plans

Appendix B.

COUNTY WEED BOARD PLANS

Each ranger district should keep current copies of weed board plans for all of the counties that the district lies in.

Below are addresses for each county weed board. County plans should be available from each of these addresses.

Weed Board
Clearwater County Courthouse
Orofino, ID 83544

Flathead County
Noxious Weed Control
Kalispell, MT 59901

Weed Board
Granite County Courthouse
Philipsburg, MT 59858

Weed Board
Idaho County Courthouse
Grangeville, ID 83530

Weed Board
Lake County Courthouse
Ronan, MT 59864

Weed Board
Lewis & Clark County Courthouse
Helena, MT 59601

Weed Board
Mineral County Courthouse
Superior, MT 59872

Weed Board
Missoula County Courthouse
Missoula, MT 59801

Weed Board
Powell County Courthouse
Deerlodge, MT 59722

Weed Board
Ravalli County Courthouse
Hamilton, MT 59840

Weed Board
Sanders County Courthouse
Thompson Falls, MT 59873

Weed Board
Shoshone County Courthouse
Wallace, ID 83873

APPENDIX C – Monitoring Plan

Appendix C.
MONITORING PLAN

This monitoring plan describes how the Lolo National Forest would monitor: (1) the noxious weed management program proposed under the Forest Plan amendment (see Appendix I of this FEIS), and (2) site-specific weed control project activities.

Monitoring of the overall weed control program is referred to as ***Forest Plan level-monitoring.*** Monitoring site-specific weed control activities is referred to as ***project level-monitoring.***

Project-Level Monitoring.

Monitoring occurs on a site-specific basis at the project or activity level. Weed management monitoring needs will vary based on the type and scale of project. Each project interdisciplinary team (ID team) has the responsibility to determine the monitoring needs on each project.

Type of Project: Weed Control or Weed Prevention? Two types of projects will involve weed management. The first type of project includes those that focus specifically on weed control. The second type of project includes the more general management activities (such as road construction, mining operations, and livestock grazing) that can be mitigated to prevent the spread of weeds.

The management objective of control projects is to eradicate, suppress, or contain weeds. Other types of projects will have other primary management objectives, but preventing weed spread will often be a secondary objective.

Monitoring requirements will vary with the type of project. These requirements fall into four general areas, and are listed below. Weed control projects require all four types of monitoring. Weed prevention projects require the first two types of monitoring.

MONITORING REQUIREMENTS	PROJECT TYPE
1) Monitor to assure compliance with the mitigation measurements amended to the Forest Plan (Appendix W in the Plan, Appendix D in the Weed FEIS).	Weed Control & Weed Prevention
2) Monitor to determine the effectiveness of weed control and prevention measures.	Weed Control & Weed Prevention
3) Monitor resource response following weed control.	Weed Control
4) Monitor for environmental effects following weed control.	Weed Control

Project-Level Monitoring Techniques. Monitoring plans are developed for each project by a team of interdisciplinary specialists. The monitoring plans will describe the appropriate techniques and sampling precision necessary for each project, based on the type and scale of project, and natural resources involved.

Vegetation. The techniques used for monitoring vegetation can be as simple as repeat photography at permanent photopoints for small scale, minimal impact projects. When additional information is needed, the ECODATA vegetation sampling techniques described in the ***Northern Region Ecosystem Classification Handbook*** will be used. Methods include sampling species composition and frequency in a replicated sampling design that allows statistical analysis of quantitative vegetational data. Sampling is conducted in replicated microplots in a permanently located maccrplot. Production data can also be collected within microplots for statistical analysis.

Water. Monitoring of surface water in the vicinity of weed treatment areas is appropriate if chemical application is involved. Monitoring might include collection and lab analysis of baseline water samples prior to chemical application, followed by repeat measurements. Storm events occurring after application would also prompt additional repeat sampling.

In addition to water sampling, it may be appropriate to sample baseline and post-treatment aquatic insect drift in streams.

Forest Plan-Level Monitoring.

Forest Plan-level monitoring is described in Table C-1. The five items in that table would be amended into Forest Plan Table V.1 (page V-11). The Forest Plan Monitoring and Evaluation Process is described in detail in Forest Plan pages V-2 through V-15.

Monitoring and evaluation of these five items would address the following questions:

- Are we accomplishing the indirect controls (information, inventory, biological control support) projected in the proposed amendment?

- Are we applying direct weed controls (physical, biological, and chemical) projected in the proposed amendment?

- Were the weed infestation levels and spread rates assumed in this EIS valid?

- Are we meeting our control objectives for each weed species?

- Are we implementing weed prevention and control at the project-level? Are our prevention and control measures effective?

- Do the results of this monitoring suggest the need for corrective actions (changes in management practices or in Forest Plan objectives, assumptions or standards)?

Table C-1: Proposed Additons to FOREST MONITORING REQUIREMENTS (Forest Plan Table V.1)

MONI-TORING ITEM	SUBJECT	ACTIVITY, PRACTICE OR EFFECT TO BE MEASURED	DATA SOURCE	EXPECTED PRECISION[1]	EXPECTED RELIABILITY[2]	FREQUENCY OF MEASUREMENTS[3]	REPORTING PERIOD	VARIABILITY ± WHICH WOULD INITIATE FURTHER EVALUATION
6-3	RANGE	Compare projected to actual funding for indirect control (information, inventory and biological support).	Project plans, NEPA documents, contracts.	High	High	Annual	Annual	15%
6-4	RANGE	Compare projected to actual acres of direct treatment (mechanical, chemical and biological methods).	Project EA's and contracts, FS-2100-1 Pesticide Use, and similar reporting for biological and physical weed control.	High	High	Annual	Annual	25% of acres projected to be treated in Weed EIS.
6-5	RANGE	Validate Weed EIS assumptions for weed acres and rates of spread.	Weed inventory and mapping program.	Moderate	Moderate	Annual	5 years	Unacceptable results of an ID team review.
6-6	RANGE	Monitor the attainment of control objectives for each of the nine species listed in the Weed EIS.	Weed inventory and mapping program. Project monitoring.	Moderate	Moderate	Weed monitoring and mapping program - Annual. Project monitoring schedule developed by ID team.	5 years	Unacceptable results of an ID team review.
6-7	RANGE	Random review of projects, field reviews, & contracts to assure that: 1) weed prevention and control is addressed during planning and implementation, and 2) that treatments are effective.	EA's, project files, contracts, agreements and field reviews.	Moderate	Moderate	One project/ District annually.	Annual	Departure from management direction OR Ineffective treatment practices.

[1] "Expected Precision" is the exactness or accuracy with which the data will be collected.
[2] "Expected Reliability is the degree the monitoring accurately reflects the total Forest situation.
[3] "Frequency of Measurements" is the schedule of sampling frequency.

Table C-1: Proposed Additons to FOREST MONITORING REQUIREMENTS (Forest Plan Table V.1)

MONI-TORING ITEM	SUBJECT	ACTIVITY, PRACTICE OR EFFECT TO BE MEASURED	DATA SOURCE	EXPECTED PRECISION[1]	EXPECTED RELIABILITY[2]	FREQUENCY OF MEASUREMENTS[3]	REPORTING PERIOD	VARIABILITY ± WHICH WOULD INITIATE FURTHER EVALUATION
6-3	RANGE	Compare projected to actual funding for indirect control (information, inventory and biological support).	Project plans, NEPA documents, contracts.	High	High	Annual	Annual	15%
6-4	RANGE	Compare projected to actual acres of direct treatment (mechanical, chemical and biological methods).	Project EA's and contracts, FS-2100-1 Pesticide Use, and similar reporting for biological and physical weed control.	High	High	Annual	Annual	25% of acres projected to be treated in Weed EIS.
6-5	RANGE	Validate Weed EIS assumptions for weed acres and rates of spread.	Weed inventory and mapping program.	Moderate	Moderate	Annual	5 years	Unacceptable results of [illegible] ID team review.
6-6	RANGE	Monitor the attainment of control objectives for each of the nine species listed in the Weed EIS.	Weed inventory and mapping program. Project monitoring.	Moderate	Moderate	Weed monitoring and mapping program - Annual. Project monitoring schedule developed by ID team.	5 years	Unacceptable results of an ID team review.
6-7	RANGE	Random review of projects, field reviews, & contracts to assure that: 1) weed prevention and control is addressed during planning and implementation, and 2) that treatments are effective.	EA's, project files, contracts, agreements and field reviews.	Moderate	Moderate	One project/ District annually.	Annual	Departure from management direction OR Ineffective treatment practices.

[1] "Expected Precision" is the exactness or accuracy with which the data will be collected.
[2] "Expected Reliability is the degree the monitoring accurately reflects the total Forest situation.
[3] "Frequency of Measurements" is the schedule of sampling frequency.

APPENDIX D – Mitigation, Management Requirements, Standards & Guidelines

Appendix D.
MITIGATION

The mitigation measures listed in this appendix will be ***management requirements***. Each management requirement has one or more "Best Known Practices" for meeting the requirement. These practices must be followed unless site-specific environmental analysis determines and documents that the practice is not needed in a particular case, or that the management requirement intent could be better-met through other means.

The purpose of these requirements is to ensure that planning for all forest activities includes weed prevention, and to ensure mitigation for possible effects in weed control projects. The practices listed for meeting these these requirements represent state-of-the-art mitigation as of this writing, under general conditions. Better methods may emerge in the future, and/or when site-specific factors are considered in project planning.

These management requirements and best known practices will be amended to the Forest Plan as discussed in Appendix I of this FEIS. Since herbicides would not be used in Alternatives A or D, the group of herbicide measures only applies to Alternatives B, C, and E. All other measures apply to all alternatives.

This appendix has three sections:

- **Weed Prevention Measures**
- **Weed Control Project Mitigation**
- **Seeding Guidelines**

Weed Prevention Measures

Management Requirement	**Best Known Practices** (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
Roads	
1) Incorporate weed prevention into road layout, design, and alternative evaluation.	**1.1)** During transportation planning and alternative development, consider weed risk factors (presence of weeds, habitat type, aspect, shading, etc.) to evaluate road location and design.
2) Remove seed source that could be picked up by passing vehicles and limit seed transport into relatively weed-free areas at moderate or high ecological risk.	**2.1)** Before construction equipment moves into a relatively weed-free area at moderate or high ecological risk; mow, grade or otherwise treat all seed-bearing noxious weed plants on the travelway of existing Forest Service access roads. Treated sites must be reseeded as described in Weed Prevention Measure #4.1. **2.2)** Clean off-road equipment (power or high-pressure cleaning) of all mud, dirt, and plant parts before moving into relatively weed-free areas at moderate or high ecological risk. (This is not meant to apply to service vehicle that will stay on the roadway, traveling frequently in and out of the project area.)

Weed Prevention Measures

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
3) Retain shade to suppress weeds.	**3.1)** Minimize the removal of trees and other roadside vegetation during construction, reconstruction, and maintenance, particularly on south aspects.
4) Re-establish vegetation on all bare ground to minimize weed spread.	**4.1)** For all construction, reconstruction, and maintenance activities, seed all disturbed soil (except traveled way) within seven days of work completion at each site – unless ongoing disturbance at the site will prevent weed establishment. In that case, seeding shall be done within seven days of final disturbance. Use a seed mix that includes fast, early growing species to provide quick, dense re-vegetation. Seed should be certified relatively weed-free and/or analyzed (as deemed appropriate by the Forest Soils Scientist) before purchase to ensure minimum weed content. Consider the following options: ● fertilization concurrent with seed application, and follow-up fertilization; ● applying relatively weed-free mulch with seeding; ● double-seed, full rate at initial ground disturbance, and full rate again at the end of the project. See the current ***Lolo Seeding Guidelines*** for detailed procedures and appropriate mixes.
5) Minimize weed spread caused by moving infested gravel and fill material to relatively weed-free locations.	**5.1)** Gravel and fill to be placed in relatively weed-free areas which are at moderate or high ecological risk to weed invasion must come from relatively weed-free sources. Inspect gravel pits and fill sources to identify relatively weed-free sources.
6) Minimize sources of weed seed in areas not yet revegetated.	**6.1)** Keep active road construction sites which are in relatively weed-free areas at moderate or high ecological risk to weed invasion closed to vehicles that are not involved with construction.
7) Ensure establishment and maintenance of vigorous, desirable vegetation to discourage weeds.	**7.1)** Monitor all seeded sites. Re-fertilize and spot re-seed as needed. Prefer native, pioneer species for seeding (low nutrient demanding) to minimize the need for fertilization. **7.2)** Road maintenance programs should include scheduled fertilization where needed (three year period suggested).
8) Minimize roadside sources of weed seed that could be transported to other areas.	**8.1)** Road maintenance programs should include monitoring for noxious weeds. Weed infestations should be inventoried and scheduled for treatment according to the selected alternative. Consider developing timber sale "C" clauses and "T" specifications to collect deposits for use in weed-control road maintenance.
9) Ensure that weed prevention and related resource protection is considered in travel management.	**9.1)** Consider weed risk and spread factors in Travel Plan (road closure) decision-making.

Weed Prevention Measures (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
Recreation, Wilderness, Roadless Areas	
10) Minimize transport of weed seed into backcountry and Wilderness.	**10.1)** Require all pack and saddle stock in backcountry, Wilderness or proposed Wilderness to use only certified weed-free feed. Prohibit straw bedding unless it is also certified weed-free. (In established Wilderness, this requirement should be defered to the Limits of Acceptable Change planning process). **10.2)** Before entering backcountry, Wilderness, or proposed Wilderness, pack and saddle stock should be quarantined and fed only weed-free feed for 24 hours. Before quarantine, tail and mane should be brushed out to remove any weed seed.
11) Encourage a weed-free trail user's ethic.	**11.1)** Sign trailheads for weed awareness and weed prevention techniques.
12) Ensure that areas under permit have on-site weed control and minimize spread to other areas.	**12.1)** Revise recreation special use permits to require weed treatment consistent with the Forest Plan Amendment for noxious weed management. Require all bare soil to be re-seeded as described in Weed Prevention Measure #4.1.
Cultural Resources	
13) Ensure all bare ground is covered by desirable vegetation to discourage weeds.	**13.1)** Archeological site excavations will be reseeded to the standards given in Weed Prevention Measure #4.1.
Wildlife	
14) Incorporate weed prevention into wildlife habitat improvement project design.	**14.1)** Environmental analysis for habitat improvement projects (prescribed fire) will include weed risk considerations in the development and evaluation of alternatives.
Range	
15) Minimize the creation of bare soil and other factors that support weeds.	**15.1)** Manage allotments to prevent excessive soil disturbance at salt licks, watering sites, and sensitive soil conditions. **15.2)** All salt must be kept in containers and moved periodically.
16) Minimize weed seed transport to relatively weed-free areas at moderate or high ecological risk.	**16.1)** In range allotments that have both weed-infested and relatively weed-free areas at moderate or high ecological risk, control timing of animal movement from infested to noninfested areas. Prevent movement from infested to non-infested areas after weed seed set.

Weed Prevention Measures (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
17) Ensure success of re-vegetation efforts to minimize weed spread.	**17.1)** Avoid grazing any re-seed sites until vegetation is well established.
18) Retain desirable roadside vegetation to discourage weeds.	**18.1)** Roadside vegetation should not be included when calculating allotment grazing capacity.
Timber	
19) Ensure that weed prevention is considered in all timber management project design.	**19.1)** Consider weed risk and prevention factors (e.g., maximize shade and minimize soil disturbance) in all silvicultural prescriptions, and in alternative development and evaluation for all timber sale environmental analyses.
20) Minimize the creation of sites suitable for weed establishment.	**20.1)** Minimize soil disturbance: ● no more than needed for tree regeneration, ● prefer winter skidding on high weed-risk sites, ● prefer broadcast burning over dozer piling, ● when using dozer piles, prefer small piles and burn under conditions that minimize heat transfer to the soil, ● avoid dozer fireline construction on high weed risk sites, ● ensure prompt regeneration to maximize shading, ● seed skid trails, landings and other disturbed sites as described in Weed Prevention Measure #4.1.
21) Remove seed source that could be picked up by passing vehicles and limit seed transport into relatively weed-free areas at moderate or high ecological risk.	**21.1)** Before skidding equipment moves into a relatively weed-free area at moderate or high ecological risk; mow, grade or otherwise treat all seed-bearing noxious weed plants on the travelway of existing Forest Service access roads. Treated sites must be reseeded as described in Weed Prevention Measure #4.1. **21.2)** Clean skidding equipment (power or high-pressure cleaning) of all mud, dirt, and plant parts before moving into relatively weed-free areas at moderate or high ecological risk.
22) Examine weed prevention and treatment needs, and seek funding sources.	**22.1)** Inspect proposed timber sale areas for weed status and risk. Collect KV or or other funds to prevent, monitor, and treat soil disturbance or weeds as needed during and after timber harvest and regeneration activities.
Minerals	
23) Minimize chances of weed establishment in mining operations.	**23.1)** Include weed prevention and treatment in all mining plans of operation and reclamation plans. Retain bonds for weed control until the site is returned to vegetative conditions matching the surrounding area.

Weed Prevention Measures (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
24) Remove seed source and limit seed transport into relatively weed-free areas at moderate or high ecological risk.	**24.1)** Before equipment moves into a relatively weed-free area at moderate or high ecological risk, mow, grade or otherwise treat all noxious weeds along existing access roads (include in plan of operation). Treated sites must be reseeded as described in Weed Prevention Measure #4.1. **24.2)** Clean equipment (power or high-pressure cleaning) of all mud, dirt, and plant parts before moving into relatively weed-free areas at moderate or high ecological risk (include in plan of operation).
25) Ensure that all disturbed soil is re-vegetated as soon as possible to discourage weeds.	**25.1)** Re-seed all bare soil within seven days as described in Weed Prevention Measure #4.1 (include in plan of operation).
Lands	
26) Incorporate weed prevention in all lands projects.	**26.1)** Consider weed risk, prevention, and treatment factors in alternative development and evaluation for all project planning. **26.2)** Require weed control until the site is returned to a vegetative condition that matches the surrounding area.
27) Ensure quick re-establishment of desired vegetation to discourage weeds.	**27.1)** Require all bare soil resulting from lands related projects, including special use permits and cost-share roads, to be re-seeded within seven days as described in Weed Prevention Measure #4.1.
Fire *(see also measures under Timber and Wildlife)*	
28) Ensure that fire suppression and rehabilitation efforts minimize weed spread.	**28.1)** Include weed risk factors and weed prevention considerations in the Resource Coordinator duties on all Incident Overhead Teams and Fire Rehabilitation Teams. **28.2)** During fire rehabilitation, re-seed all disturbed soil in relatively weed-free areas at moderate or high risk to weeds as described in Weed Prevention Measure #4.1.

Weed Control Project Mitigaton

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
All Methods	
1) Ensure consideration of site-specific factors.	**1.1)** Each weed control project will have site-specific environmental analysis and documentation.
2) Ensure that Threatened, Endangered, and Sensitive species effects are considered for each project.	**2.2)** Each weed control project will have site-specific Biological Assessment.
3) Prepare and follow project-specific measures to protect worker safety.	**3.1)** Each force-account project will include job hazard analysis and planning as required in the Health and Safety Code (FSH 6709.11).
4) Minimize soil disturbance.	**4.1)** Keep heavy equipment off highly erodible slopes.
Physical Methods	
5) Retain streamside vegetation for shading and bank stability.	**5.1)** Heavy equipment will not be used off roads to mow within 30 feet of any streambank (hand-held equipment allowing more selective mowing would be used in this zone).
Biological Methods	
6) Minimize trampling, riparian overutilization, and other adverse effects.	**6.1)** When grazing is considered for weed control, the effects of grazing on water and soils, riparian areas, and recreation will be considered in alternative development and evaluation.
7) Minimize transport of weed seed.	**7.1)** When transporting insect biological agents with host weed material, use containers that prevent release of weed seeds.
8) Protect Sensitive plants.	**8.1)** Identify Sensitive plants that could be affected by selected biological agents, survey proposed project site for those plant species, and develop project-specific measures to protect Sensitive species.
Chemical Methods	
9) Ensure thorough analysis of possible effects of chemicals.	**9.1)** For proposed use of picloram, 2,4-D, or glyphosate, tier project environmental analysis to the Lolo Noxious Weed Management EIS for chemical effects. **9.2)** For proposed use of any other chemicals, additional environmental analysis (similar to that in the Lolo Noxious Weed Management EIS) must be completed. **9.3)** For proposed application methods not covered in the Lolo Noxious Weed Management EIS (e.g., aerial application), addition environmental analysis must be completed.

Weed Control Project Mitigaton (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
10) Prevent effects on aquatic organisms.	**10.1)** All proposed spray projects involoving riparian ecosystems will be reviewed by at least two of the following individuals: Forest Soil Scientist, Forest Hydrologist, and/or Forest Fisheries Biologist. ***When such projects propose the use of picloram,*** the "Worst Case Criteria for the Low Resolution Risk Assessment" methodology (Rice 1990) will be used to calculate a **maximum** probable concentration of picloram in stream water. The following is a generalized formula, see Rice (1990) for a more complete discription and appropriate tables. **Step 1:** Determine P, the total amount of picloram to be applied in a watershed: P (lbs) = R (lbs/ac) X A (ac) where R is the application rate of active ingredient and A is the total acreage treated. **Step 2:** Determine if the soil texture of the site would produce overland flow or allow infiltration (refer to citation). **Step 3:** Detrmine Y, the maximum yield in pounds of picloram that could potentially reach surface waters: Y (lbs) = P (lbs) x D (%) where D is the delivery ratio or the maximum fraction of the applied picloram reaching surface waters. On sites producing overland flow, D is expected to be less than 10%, approaching 1% or less. The delivery ratio of 10% is assumed to incorporate a safety factor. On sites likely to allow infiltration, D is not expected to exceed 1%, and in fact is zero for most sites, but a delivery ratio of 1% is used to provide a safety factor. **Step 4:** Determine the worst case (minimum) capacity (C) for dilution in pounds of water of the surface water system in the watershed where the application is to occur: C (lbs) = F (cfs) x 62.43 lbs/cfs x T (sec) where F, the flow rate of the stream is expressed in cubic feet per second, and T denotes the time period in seconds over which the flow discharge yielding picloram is being estimated. The flow rate for a small stream can be estimated by multiplying: (width) x (average depth) x (velocity in feet per second). A cubic foot of water weighs 62.43 pounds. The minimum delivery time for overland flow-dominated systems is assumed to be 6 hours (21,600 sec), and 24 hours (86,400 sec) for infiltration dominated sites. **Step 5:** Estimate M, the maximum possible concentration in parts per million: M (ppm) = [y (lbs) ÷ C (lbs)] x 1,000,000 The resulting value can then be compared to known toxicity levels for aquatic organisms. The Fisheries Biologist must then use professional judgment to assess risk and/or suggest project-design modifications (e.g., if M ≥ NOEL for sensitive aquatic species, the amount of picloram could be reduced, or the application timing could be changed to coincide with stream flow rates high enough to offer adequate dilution).

Weed Control Project Mitigaton (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
11) Minimize potential for adverse human and environmental effects by minimizing potential for drift and non-target impacts.	**11.1)** Select application methods and rates which minimize potential for drift and non-target impacts while meeting weed control objectives. Application rates should not exceed the following (active ingredient lbs/ac): **Picloram** – 0.50; **2,4-D** – 2.00; **Glyphosate** – 4.05. **11.2)** Application personnel will be trained by, and all application will be under the ***direct*** supervision of a State-certified pesticide applicator. **11.3)** All herbicide applications will follow EPA label requirements, USDA policy, and Forest Service policy and direction (e.g., FSM 2150 Pesticide-Use Management and Coordination; FSH 2109.11 Pesticide Project Handbook; FSH 2109.12 Pesticide Storage, Transportation, Spills, and Disposal Handbook; and FSH 2109.13 Pesticide Project Personnel Handbook). **11.4)** No boom or broadcast equipment will be used in ***riparian ecosystems*** (as defined in the Lolo Forest Plan glossary and in Hansen, Chadde, and Pfister 1988); use only hand-held nozzles or wick applicators. **11.5)** Applicators will select nozzles and other technology to minimize drift. Before beginning a new job, nozzles should be inspected or replaced. **11.6)** Site-specific project planning will determine appropriate timing and buffer zones where herbicide application will be prohibited. Buffer zones will be marked on the ground before spraying begins. These buffer zones will protect open water (recommend 30 feet for picloram and 2,4-D), sensitive plants, desired vegetation such as regeneration conifers (picloram should not be applied within the root zone of any plants to be protected), and nearby private land that owners do not want sprayed. See Boyd and others (1985) for timing considerations near conifers. **11.7) *Picloram*** will not be applied in the following situations: ● where soils have a rapid to very rapdid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow; ● within ***riparian ecosystems*** (as defined in the Lolo Forest Plan glossary and in Hansen, Chadde, and Pfister 1988); inside the banks of ditches or any stream, including ephemeral streams; ● within buffer zones as discussed above in Weed Control Measure #11.6. **11.8) *2,4-D***,will not be applied within buffer zones as discussed above in Weed Control Measure #11.6 **11.9) *Glyphosate*** (in the Rodeo® formulation) will only be applied in situations near water where picloram and 2,4-D are not allowed. When glyphosate is selected, target weed plants should be in monoculture patches, or the loss of adjacent non-target plants must be an acceptable aspect of the control project.

Weed Control Project Mitigaton (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
	11.10) Weather conditions will be monitored before and during all spray projects. Spraying will not be allowed when any of the following conditions are exceeded. ***Hand-held equipment:*** Temp. ≥ 98° F, Humidity ≤ 20%, or Wind ≥ 15 mph. ***Truck-mounted equipment:*** Temp. ≥ 95° F, Humidity ≤ 30%, or Wind ≥ 10 mph. (Yates et al. 1978).
12) Ensure no effect on Threatened or Endangered species.	**12.1)** No herbicide will be applied within occupied grizzly bear habitat unless project analysis indicates "no risk" via direct or indirect consumption of food sources. **12.2)** No herbicide will be applied within one to two miles of historic or suitable peregrine falcon aeries, or proposed hack sites (specific distances will be determined at the project level) unless project-level analysis indicates "no risk" via indirect consumption. **12.3)** No herbicide will be applied within ½ mile of rivers within essential bald eagle habitat unless project analysis indicates "no risk" for indirect effects.
13) Ensure revegetation of all herbicide-treated sites with desirable plants to discourage weeds.	**13.1)** All herbicide projects will include an assessment of re-vegetation needs, monitoring, and any necessary follow-up re-vegetation work.
14) Protect worker health and safety.	**14.1)** All applicators must wear protective clothing including: long-sleeved shirt and long pants made of tightly woven cloth. These clothes must be cleaned daily. Workers must also wear, waterproofed boots, gloves, and any other safety clothing and equipment recommended or required by the herbicide label. **14.2)** Crews will also carry additional safety equipment to each spray site, including soap, wash water separate from drinking water, eyewash kits, first aid equipment, and extra clothing. Worker health and safety.
15) Minimize risk and impacts of accidental spills or water contamination.	**15.1)** Herbicides will be transported daily to the project site with the following conditions: ● transport only the quantity needed for that day's work; ● transport only concentrate in containers in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment; ● mixing will only be done on site. **15.2)** Mixing, loading, and equipment cleaning must be done more than 200 feet from private land (unless the owner is cooperating in the project), open water, or other sensitive resources. Mixing and cleaning water must come from public or cooperator supplies, and must be transported to the site in labelled containers that are separate from water used for other purposes. **15.3)** All spray equipment will be inspected daily for leaks.

Weed Control Project Mitigaton (continued)

Management Requirement	Best Known Practices (must be followed unless the intent of the first column can be better met with an alternative method which is discussed in the project environmental document)
16) Ensure proper disposal of toxic chemical containers.	**16.1)** All herbicide containers will be disposed of in accordance with all label, State, and Federal requirements.
17) Project-specific public involvement will develop ways to avoid or mitigate potential impacts on religious, cultural, plant-gathering, or other areas or resources used by people.	**17.1)** Scoping for each proposed project will include notification of Native American Cultural committees, as well as all other potentially interested parties, early in the environmental analysis and planning process.
18) Protect public health and safety, and ensure that those who want to avoid spray sites will be notified of project locations.	**18.1)** Spray sites will be posted (with the pesticide notification signs in FSH 7109.11a, 81.31a, poster P21-3 or similar sign stating treatment date, chemical(s) used, and address and phone number for more information) at all access points two weeks before, during, and two weeks following herbicide application. Project personnel will prevent anyone from entering the project site until the spray solution has dried.

Lolo National Forest Seeding Guidelines, 1991 Update

The following guidelines are current as of February 1991. These guidelines are subject to revision as we acquire new knowledge and technology. They are included here as an example of the detailed guidance that is available for projet-level weed prevention and control.

A. ***Soil Preparation***

1. Compacted soil will be scarified by ripping prior to reseeding. Those areas to be scarified will be mutually agreed upon (e.g.,landings, road surfaces, skid trails, etc.).

2. Soil on areas to be seeded shall be left in a roughened condition favorable to the retention and germination of seed. A minimum of 1/2 inch of surface soil shall be in a loose condition, unless otherwise specified.

3. Areas to be seeded, which are damaged by erosion or other causes, shall be restored prior to seeding. Except for slopes intentionally left in a roughened condition, all areas to be seeded shall be finished and then cultivated to provide a reasonably firm but pliable seedbed (applies to gently sloping ground). In all areas, care will be taken to assure a good seedbed.

4. When scarification is required to break up compacted surfaces, soils shall be ripped to a depth of not less than 6 inches (but best in the 10 to 12 inch range), with rippers not more than 16 inches apart unless otherwise agreed upon. Care should be taken to rip rather than plow the areas, and proper seedbeds must be prepared.

B. ***Seeding Seasons***

No application work shall be done during <u>extremely</u> windy or rainy weather. Also, no seed shall be applied to bare, frozen ground nor <u>extremely</u> wet ground. Seeding on snow-covered ground is acceptable. Seeding should occur within 7 days of final grading, ripping or disturbing activity.

C. ***Application Methods for Seed and Fertilizer***

1. The kinds of seed and amounts to be applied in terms of Pure Live Seed (PLS) are shown in the seed mixtures. Seed mixture rates are for broadcast seeding.

   Pounds of seed to be furnished per acre shall be obtained by dividing the pounds of PLS required per acre by the product of the percent purity and percent germination.

   <u>Example:</u> (lbs PLS/ac) ÷ [(% purity) x (% germination)] = lbs comercial seed/ac

2. Fertilizer shall be furnished and applied to all areas that have had the topsoil removed or destroyed. Areas that require vigorous growth will also need fertilization.

   For example, an application of 200 pounds per acre of 16-16-16 would provide the needed fertilization. The best way to apply fertilizer is 100 pounds per acre at the time of seeding and 100 pound per acre the following spring after germination and before the end of the rainy season, normally prior to June 15.

D. *Application of Mulch*

Mulch maybe applied as vegetative or wood cellulose mulch on all areas seeded.

1. **Vegetative Mulch**:

   a. Vegetative mulch shall be applied after seeding (and fertilizing if required) is completed. The mulch shall be applied uniformly at the rate of 2,000 pounds per acre. Mulch material shall be clean straw or grass hay. <u>Hay and straw shall be certified weed free.</u>

   b. Asphalt maybe used as a binder for vegetative mulch and shall be applied at the rate of 200 gallons per acre. It shall be evenly distributed over the mulch material as it emerges from the blower discharge. Asphalt adhesive materials shall not mark or deface structures, appurtenances, pavements, utilities, or plant growth.

2. **Wood Cellulose Fiber Mulch:**

   Wood cellulose fiber mulch (and fertilizer if required) or paper mulch, and fertilizer may be applied in one operation by means of hydraulic equipment that uses water as the carrying agent. A continuous agitator action that keeps the materials in uniform suspension must be maintained throughout the distribution cycle. The discharge line shall provide an even distribution of the solution to the seedbed. Mulching shall not be done in the presence of free surface water. Application shall start at the top of the slopes and work downward. If necessary, the use of extension hoses may be required to reach the extremities of the slopes. The rate of application shall be 2,000 pounds of wood cellulose mulch per acre.

E. *Care During Revegetation*

1. The contractor shall be responsible for protecting and caring for seedbed areas until final acceptance of the work. Any damage to seeded areas caused by construction operations shall be repaired.

2. Surface erosion, gullies, or other damage following seeding, shall be repaired by regrading, reseeding, and refertilizing as necessary to maintain the areas in a satisfactory condition.

Seed Mixture 1: DRY WARM SITES (AREAS SUBJECT TO SEVERE NOXIOUS WEED INVASION)

Site Conditions: 12 to 25 inches precipitation; relatively long growing season; south and west slopes; moderately coarse to medium soil textures and somewhat droughty to very drouthy. These sites have a high potential for weed invasion. The following seed mix was developed to give a maximum of competition and shade to noxious weeds. It reflects the latest information we have on desirable plant competitive ability with weeds. It will change as we learn more. It is recommended for roadsides or other sites where we anticipate a threat of noxious weed invasion.

Other Considerations: These areas are generally used as winter range by wildlife and are typically low elevation sites.

Range of Habitat Types:

All Pipo H.T.
Psme, Agsp, Feid, Caru-Agsp, Caru-Aruv, and low elevation Phma-caru.

Seed Mix #1

Common Name	Species Name	lbs PLS[1]/ac
Annual Ryegrass	*Lolium multiflorum*	3.0
Smooth Brome †	*Bromus inermis*	4.0
Crested Wheatgrass	*Agropyron cristatum*	4.0
Sheep Fescue	*Festuca ovina*	3.0
Intermediate Wheatgrass †	*Agropyron intermedium*	2.5
Yellow Sweet Clover[2]	*Melilotus officinalis*	1.5
TOTAL		18.0

† On granitic soils, substitute:

Redtop	*Agrostis alba*	2.0
Garrison Creeping Foxtail	*Alopecurus arundinaceae*	4.0

[1]—PLS = Pure Live Seed

[2]—Legume seed shall be inoculated with approved cultures in accordance with instructions of the manufacturer. The inoculum used for hydraulic seeding shall be four times that recommended for dry seeding. Inoculum shall be stored and handled in accordance with instructions of the manufacture.

Seed Mixture 2: RELATIVELY DRY-MOIST AND MODERATELY COOL SITES

Site Conditions: 18 to 35 inches precipitation; mid elevational slopes that have a wide range of moisture and temperature conditions which vary generally by aspect; moderately coarse to medium soil textures. These sites are subject to dry periods during the summer and cuts can be very droughty. These sites have a moderate potential for weed invasion.

Range of Habitat Types:

Psme/Phma-phma, Caru-caru, Libo, Vagl, Vac, Syal
Abgr, Xete
Inclusions of wet sites may occur but should be small.

Seed Mix #2

Common Name	Species Name	lbs PLS[1]/ac
Annual Ryegrass	*Lolium multiflorum*	3.0
Crested Wheatgrass	*Agropyron cristatum*	4.0
Orchardgrass	*Dactylis glomerata*	4.0
Smooth Brome	*Bromus marginatus*	3.0
Yellow Sweet Clover[2]	*Melilotus officinalis*	1.0
Ladak Alfalfa[2]	*Medicago sativa*	1.0
Hard Fescue	*Festuca ovina var. duriuscula*	2.0
TOTAL		18.0

[1]—PLS = Pure Live Seed

[2]—Legume seed shall be inoculated with approved cultures in accordance with instructions of the manufacturer. The inoculum used for hydraulic seeding shall be four times that recommended for dry seeding. Inoculum shall be stored and handled in accordance with instructions of the manufacturer.

Seed Mixture 3: MOIST AND COOL-COLD SITES

Site Conditions: 30 to 60+ inches precipitation; mid to high elevation slopes that are generally nondroughty. These sites may have some wet inclusions and have a relatively short growing season. Soils are generally acidic and range from moderately coarse to medium textured.

Range of Habitat Types:

Abgr/Clun, Libo
Thpl/Clun
Abla/Libo, Clun, Xete, Vaca, Vagl
with inclusions of:
Abla, Mefe, Gatr, Caca
Tsme/Xete

Seed Mix #3

Common Name	Species Name	lbs PLS[1]/ac
Annual Ryegrass	*Lolium multiflorum*	3.0
Timothy †	*Pleum pratense*	2.0
Orchardgrass †	*Dactylis glomerata*	2.0
Canada Bluegrass †	*Poa compressa* - Reubens	1.0
Hard Fescue †	*Festuca ovina* var. *duriuscula*	2.0
White Dutch Clover[2]	*Trifolium repens*	1.0
Mountain Brome	*Bromus marginatis*	3.0
TOTAL		14.0

† Substitutes, if necessary:

Redtop	*Agrostis alba*	1.0
Tall Fescue	*Festuca arundinaceae*	6.0

[1]—PLS = Pure Live Seed

[2]—Legume seed shall be inoculated with approved cultures in accordance with instructions of the manufacturer. The inoculum used for hydraulic seeding shall be four times that recommended for dry seeding. Inoculum shall be stored and handled in accordance with instructions of the manufacturer.

APPENDIX E – Emergency Spill Planning

Appendix E.

EMERGENCY SPILL PLANNING

Pesticide spill prevention and clean-up, as well as storage, transport, and disposal procedures are covered in detail in **Forest Service Handbook (FSH) 2109.12 *Pesticide Storage, Transportation, Spills, and Disposal***. Any herbicide projects would follow the direction given in this handbook. It is available for review at Forest Service offices.

Required Equipment.

The following equipment will be available with vehicles or pack animals used to transport pesticides and in the immediate vicinity of all spray operations.

1. A shovel
2. A broom (except backcountry operations)
3. 10 pounds of absorbent material or the equivalent in absorbent pillows.
4. A box of large plastic garbage bags.
5. Rubber gloves
6. Safety goggles
7. Protective overalls
8. Rubber boots

The appropriate Material Safety Data Sheets will be reviewed with all personnel involved in the handling of pesticides.

EPA Guidance/CHEMTREC.

The following material from the U.S. EPA document entitled *Applying Pesticides Correctly: A Guide for Private and Commercial Applicators* will be reviewed with all personnel involved in handling pesticides.

CLEAN UP OF PESTICIDE SPILLS

Minor Spills
Keep people away from spilled chemicals. Rope off the area and flag it to warn people. Do not leave unless someone is there to confine the spill and warn of the danger. If the pesticide was spilled on anyone, wash it off immediately.

Confine the spill. If it starts to spread, dike it up with sand or soil. Use absorbent material such as soil, sawdust, or an absorbent clay to soak up the spill. Shovel all contaminated material into a leakproof container for disposal. Dispose of it as you would excess pesticides. Do not hose down the area, because this spreads the chemical. Always work carefully and do not hurry.

Do not let anyone enter the area until the spill is completely cleaned up.

Major Spills
The cleanup of a major spill may be too difficult for you to handle, or you may not be sure of what to do. In either case, keep people away, give first aid if needed, and confine the spill. Then call Chemtrec, the local fire department, and State pesticide authorities for help.

Chemtrec stands for Chemical Transportation Emergency Center, a public service of the Manufacturing Chemicals Association. Its offices are located in Washington, D.C. Chemtrec provides immediate advice for those at the scene of emergencies.

Chemtrec operates 24 hours a day, seven days a week, to receive calls for emergency assistance. For help in chemical emergencies involving spills, leaks, fire, or explosions, call toll-free 800-424-9300 day or night. This number is for **emergencies** only.

If a major pesticide spill occurs on a highway, have someone call the highway patrol or the sheriff for help. (Carry these phone numbers with you.) Do not leave until responsible help arrives.

Northern Region Guidance.

In addition the section from the *Northern Region Emergency and Disaster Plan* entitled "Hazardous Materials Releases and Oil Spills" will be reviewed with all appropriate personnel (see following pages). Notification and reporting requirements as outlined in this section will be followed in the unlikely event of a serious spill.

HAZARDOUS MATERIALS RELEASES AND OIL SPILLS

(Excerpted from the *Northern Region Emergency and Disaster Plan*)

AUTHORITY: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and Superfund Amendments and Reauthorization Act of 1986 (SARA). Other statutes that may apply include Resource Conservation and Recovery Act (RCRA); Hazardous and Solid Waste Amendments (HSWA); Toxic Substances Control Act (TSCA); Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); Clean Water Act (CWA); and Clean Air Act (CAA).

DEFINITION: A hazardous materials emergency or oil spill is defined as any release or threat of release of a hazardous substance or petroleum product that presents an imminent and substantial risk of injury to health or the environment.

A release is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.

Releases that do not constitute an immediate threat, occur entirely within the work place, are federally permitted, or are a routine pesticide application, are not considered to be an emergency and are not covered by this direction.

RESPONSIBILITY: The first person who knows of a release and is capable of appreciating the significance of that release has the responsibility to report the release.

Only emergency release response and reporting is covered by this direction. Non-emergency reporting will be accomplished by appropriate RO staff specialists who should be notified directly of all non-emergency releases.

An emergency release of a hazardous substance or petroleum product may be from a Forest Service operation or facility; from an operation on National Forest land by a permit holder, contractor, or other third party; or from a transportation related vehicle, boat, pipeline, aircraft, etc., crossing over, on, or under Forest lands. Response and/or reporting by Forest Service employees will differ in each situation:

1. If the release is from a Forest Service facility or operation, the Forest Service and its employee(s) is clearly the "person in charge," and is fully responsible for all reporting. Immediate response

action is limited to that outlined in emergency plans and only to the extent that personal safety is not threatened.

2. If the release is from a third party operation, the Forest Service will only respond and/or report the emergency if the third party fails to take appropriate action.

3. If the release is from a transportation related incident, the Forest Service will only respond and/or report the emergency if the driver or other responsible party is unable or fails to take appropriate action.

RESPONSE ACTION GUIDE: THE PRIMARY RESPONSIBILITY OF ANY FOREST EMPLOYEE(S) ENCOUNTERING A HAZARDOUS MATERIALS EMERGENCY OR OIL SPILL IS COMPLETE AND ACCURATE REPORTING TO APPROPRIATE AUTHORITIES IN A TIMELY MANNER.

Forest Service employee(s) will not assume an incident command role for any hazardous materials emergency or oil spill, but may provide support services as directed by an authorized Federal On-Scene Coordinator (OSC) or other State or local authorized authority.

Within the limits of personal safety, common sense, and recognition of the dangers associated with any hazardous materials emergency or oil spill, Forest Service employee(s) may provide necessary and immediate response actions until an authorized OSC or other authority can take charge. These actions may include:

- Public warning and crowd control.
- Retrieval of appropriate information for reporting purposes.

Additionally, and only after verification of the type of hazardous material involved and its associated hazards, a Forest Service employee(s) may also take actions including:

- Rescue of persons in imminent danger.
- Limited action to mitigate the consequences of the emergency.

Under no condition shall a Forest Service employee(s):

- Place themselves or others in imminent danger.
- Perform or direct actions that will incur liability for the Forest Service.

IF THERE IS ANY QUESTION THAT THE EMERGENCY MAY CONSTITUTE A THREAT TO PERSONAL SAFETY, LIMIT YOUR RESPONSE TO PUBLIC WARNING AND REPORTING OF THE INCIDENT.

PRECAUTIONS: When approaching the scene of an accident involving any cargo, or other known or suspected hazardous materials emergency including oil spills:

Approach incident from an upwind direction, if possible.

Move and keep people away from the incident scene.

Do not walk into or touch any spilled material.

Avoid inhaling fumes, smoke, and vapors even if no hazardous materials are involved.

Do not assume that gases or vapors are harmless because of lack of smell.

Do not smoke, and remove all ignition sources.

ORGANIZATIONS FOR EMERGENCY AND TECHNICAL ASSISTANCE:

CHEMTREC - Chemical Transportation Emergency Center - 800-424-9300
(24 hour) (For assistance in any transportation emergency involving chemicals.)

Rocky Mountain Poison Control Center - 800-525-5042 (24 hour)
303-629-1123 (24 hour)

National Agricultural Chemicals Association - 202-296-1585
(For pesticide technical assistance and information referral.)

Bureau of Explosives - 202-293-4048
(For explosives technical assistance.)

Centers for Disease Control - 404-633-5313
(For technical assistance regarding etiologic agents.)

EPA Region 8 (MT, ND, SD)
Emergency Response Branch - 303-293-1723; FTS 564-1723

EPA Region 10 (Idaho)
Superfund Removal and Invest Section - 206-442-1196; FTS 399-1196

Montana Department of Health and Environmental Sciences (24 Hour) 406-444-6911
Water Quality Bureau - 406-444-2406
Solid Waste Management Bureau - 406-444-2821

Idaho Department of Health and Welfare
Water Quality Bureau - 208-334-5867
Solid Waste Bureau - 208-334-5879

HAZARDOUS MATERIALS RELEASES AND OIL SPILLS -- CONTACT LIST AND IMMEDIATE ACTION GUIDE

INDIVIDUAL ON SCENE

Actions	Contacts
Do not expose yourself or others to any unknown material. a. Do not attempt rescue or mitigation until material has been identified and hazards and precautions noted. b. Warn others and keep people away. c. Approach only from upwind. d. Do not walk in or touch material. e. Avoid inhaling fumes and vapors. f. Do not smoke, and remove ignition sources. Report the incident. Complete "Reporting Action Guide" within reasonable limits of exposure and timeliness, and report information to District/Forest Dispatcher. If there is any question that incident is a threat to personal safety, limit response to public warnings and reporting.	District Dispatcher or Ranger

DISTRICT DISPATCHER OR RANGER

Actions	Contacts
Insure reporting individual is aware of hazards associated with incident. Obtain as much information as possible, complete a copy of the "Reporting Action Guide," and relay all information to Forest Dispatcher. For fixed facilities, verify if possible, whether or not an emergency guide, Spill Prevention Control and Countermeasure Plan, or similar response plan is available for the specific emergency. If so, implement the response actions as indicated. Dispatch additional help, communications systems, etc., to incident scene if incident is on National Forest land or is caused by Forest Service activity or facility. Otherwise support as requested by official in charge. If there is any question that incident is a threat to personal safety, limit response to public warning and reporting.	Forest Dispatcher

FOREST DISPATCHER

Actions	Contacts
Immediately contact the Forest Hazardous Materials Incident Coordinator who will take the following actions: a. Determine if incident is true emergency. b. Determine who is responsible party for incident, and whether appropriate actions and reporting have been accomplished. c. From available information, determine hazards and precautions, if possible, and relay further instructions to reporting individual through the District. d. Initiate appropriate local reporting actions, and coordinate responses with District. e. Arrange Forest support for on-scene coordinator and/or local emergency response officials as requested. Make appropriate local emergency contacts as directed by Forest Hazardous Materials Incident Coordinator. Relay information from Forest Hazardous Materials Incident Coordinator back to District and up to Regional Office as appropriate.	Forest Hazardous Materials Incident Coordinator who will determine extent of emergency. If incident is determined reportable, contact: a. National Response Center (X9). b. EPA Hazmat emergency response (X3). c. Regional Incident Dispatcher (1). d. County sheriff and/or county disaster and emergency services coordinator. e. State Emergency and Disaster organizations (X12, X15, X17, X21) g. Internal Forest contacts.

REGIONAL INCIDENT DISPATCHER

Actions	Contacts
Immediately contact the Regional Hazardous Materials Incident Coordinator who will take the following actions: a. Personally work with Forest Hazardous Materials Incident Coordinator to determine extent of the emergency. If incident is reportable, implement the following actions: (1) By Data General (DG) mailing list notify: Regional Forester, Deputy Regional Foresters, Staff Directors, Attorney-In-Charge (OGC). (2) Contact other RO specialists, other Agency personnel, etc., as necessary to determine scope of problem and appropriate actions. RO specialist contacts include: (a) Regional Watershed Coordinator (if incident involves streams, lakes, rivers, etc.) (2) (b) Regional Reclamation Officer (if incident involves mining) (12) (c) Regional Safety and Health Program Manager (6) (d) Regional Cooperative Forestry and Pest Management (if pesticide related) (13) (3) Arrange Regional support for on-scene coordinator and/or local emergency response officials as requested. (4) Arrange a Regional investigation/followup team if determined to be necessary. (5) Keep Regional Forester, Staff Directors, and OGC advised of situation via routine DG updates.	Regional Hazardous Materials Incident Coordinator (11) Regional Emergency Coordinator (4) If incident is determined to be reportable, verify that National Response Center and appropriate Federal, State, and local contacts have been made. WO Engineering (Environmental Health) (W3) WO Personnel Management (Safety and Health) (W4)

HAZARDOUS MATERIALS AND OIL SPILLS REPORTING ACTION GUIDE

Although reporting requirements vary depending on the type of incident, the responsibility of the employee(s) in the field is limited to collecting appropriate information and relaying it to the proper level of the organization in a timely manner. Following is a list of the information that should be collected, if possible; however, **it is more important to maintain personal safety and report in a timely manner than to collect all information.**

1. Date:

   Time of release:
   Time discovered:
   Time reported:
   Duration of release:

2. Location:(Include State, county, route, milepost, etc.)

3. Chemical name:

   Chemical identification number:
   Other chemical data:
   NOTE: For transportation related incidents, this information may be available from the driver, placards on the vehicle, and/or shipping papers.

4. Known health risks:

5. Appropriate precautions if known:

6. Source and cause of release:

7. Estimate of quantity released:____________________gallons
   Quantity reaching water:____________________gallons
   Name of affected watercourse:

8. Number and type of injuries:

9. Potential future threat to health or environment:

10. Your name:
    Phone number for duration of emergency:
    Permanent phone number: FTS__________ Commercial______________

For transportation related incidents, also report:

11. Name and address of carrier:

12. Railcar or truck number:

If there is any doubt whether an incident is a true emergency, or whether reportable quantities of hazardous materials or petroleum products are involved, or whether a responsible party has already reported the incident, **always report the incident.**

APPENDIX F – Acreage and Spread Assumptions & Calculations

Appendix F.

ACREAGE, SPREAD RATE, AND COST ASSUMPTIONS AND CALCULATIONS

This appendix summarizes the analysis process that the Interdisciplinary (ID) Team used to quantify treatment and cost levels for each alternative. The tables explained in this appendix are all part of a computer spread sheet used to model each alternative. Values in some tables are derived by formulas that link rows and columns of one table to another, as will be explained below. The tables are set up to allow identification of species-specific and treatment-method-specific values. There are three main sections in this appendix:

- **Current Infestation and Spread Rates**
- **Treatment Levels**
- **Cost Estimates**

The central problem for this analysis was how to quantify alternatives for comparison, even though there is no detailed inventory of current weed infestation, and given that this is a programmatic, forest-wide (as opposed to a project-specific) proposed action. Objectives for the quantification were to track acreage and cost differences between the alternatives for each weed species and each control method. The purpose was comparison, not to develop highly accurate estimates. Therefore, the numbers should be interpreted as relative only, not as absolute targets or predictions. The underlying assumption is that even though there may be errors, these errors are constant across all alternatives, so comparison of alternatives based on this analysis should still be valid, even if the absolute numbers are off.

An important limit placed on the analysis is the planning horizon of ten years. The ID team felt that trying to estimate details beyond ten years would not be reasonable. The current data are already quite limited, and ongoing research and development in the weed control field may invalidate many current assumptions within a few years. The analysis process followed these major steps:

1) Identify the current infested acres by weed species.

2) Estimate the 10-year spread rate by weed species.

3) Project infested acres at the end of ten years under no action (Alternative A) by weed species.

4) For each action alternative, set decade treatment acre targets by control method and weed species.

5) Calculate the necessary annual treatment levels by control method that would be required to meet the control targets set above.

6) Calculate cost estimates by control method and weed species.

Steps 1 and 2 are discussed in the next section, steps 3, 4, and 5 in the "Treatment Levels" section, and step 6 in the "Cost Estimate" section.

CURRENT INFESTATION AND SPREAD RATES

Table F-1 shows the ID Team's estimates of current infested acres and spread rate for each weed species. This information is also displayed in Chapter III of the DEIS, Table III-3. The "acres at risk" column shows how close current infestations may be the absolute potential for each weed. As explained in the footnotes to the table, acres infested and acres at risk were taken from Losensky (1987). The ID Team's process for estimating spread rates is explained below.

TABLE F-1:

CURRENT INFESTATION, RISK ACRES, AND SPREAD RATES by weed species[a]

WEED SPECIES	ACRES INFESTED[b]	ACRES AT RISK	10-year SPREAD RATE[c]
Spotted Knapweed	225,000	431,547	3%
Diffuse Knapweed	200	267,580	25%
Canada Thistle	1,000[d]	62,261	30%
Musk Thistle	100	4,475	2%
Goatweed	6,400	428,948	25%
Houndstongue	100	307,700	40%
Leafy Spurge	3,400	446,022	100%
Tansy	500	225,762	30%
Dalmation Toadflax	50	230,940	150%
TOTAL	236,750[e]	(696,790)[f]	

[a]Except as noted, all data are from Losensky (1987).

[b]"Infested" means weeds dominate or threaten to dominate desirable vegetation (ecological risk, moderate and high risk habitats as discussed in Chapter III, pages III-6 to III-7 of the EIS). This definition excludes mere weed presence where there is no ecological risk of weed domination of other vegetation.

[c]Canada thistle current infestation acres were adjusted down from Losensky's estimate by the interdisciplinary team, based on professional judgment.

[d]Decade spread rate estimates were calculated by the interdisciplinary team, based on professional judgment. Calculations are explained in Appendix D.

[e](LNF total acres = 2,083,192).

[f]Risk acres for many species overlap -- see Table III-2. Total risk acres are sum of leafy spurge and tansy risk acres.

SPREAD RATES: Weed spread rates on the Lolo National Forest are likely to by substantially lower than those reported in the literature because:

- the Lolo is mainly forested habitat types, while most literature reports data for grassland habitat types.

- weeds generally don't compete vigorously in forest habitat types due to canopy shading and competition from brush and trees.

- in the case of spotted knapweed, the weed has probably already infested much of its most favorable sites on the Lolo, and the explosive initial phase of population growth is probably over (see the discussion of Figure III-5, pages III-11 to III-12).

For some of our weeds, road construction and reconstruction could be a major avenue of spread to new areas. While proposed mitigation under all alternatives should significantly limit such spread in the future, road activity levels can be used to estimate "worst-case" weed spread assuming no mitigation. Using road activity will probably over-estimate spread. For simplicity, the ID Team used road activity as projected in the Forest Plan under an annual timber sale program of 122 MMbf. Actual timber sales have been far lower in recent years, and the average annual road construction for 1985-1987 was 105 mi/yr, reconstruction was 67 mi/yr. This works out to an average annual disturbed area of 659 acres. However, in keeping with the upper-bound approach, road activity is estimated from the Forest Plan projection as follows:

[Construction mi/yr x 5 ac/mi] + [Reconstruction mi/yr x 2 ac/mi] = ac/yr

$$[140 \times 5] + [60 \times 2] = 820$$

<u>Spotted Knapweed Spread:</u>

a) Assume road const/reconst will be proportionally spread over all LNF habitat types (probably overestimates road construction in lower, elevation, higher weed risk habitat types). From Losensky (1987: Appendix B), this means that 21% of road activity will be in moderate and high risk habitat types. Assuming all disturbed area in moderate and high risk habitat types becomes infested with weeds, the projected decade acreage due to new road activity is:

820 ac/yr x 21% x 10 yrs = **1,720** acres

(This is a probable overestimate since it assumes no mitigation)

b) Assume very little spread beyond the canopy openings created by roads <u>except</u> along new roads in in high risk habitat types. Based on Losensky (1987), annual spread beyond roads in high risk types is 3 ft/yr. Since 3.5% of the Lolo is high risk, annual off-road spread (ac/yr) is:

spread (ft/yr) x 2 (sides/rd) x [(3.5% x mi/yr x 5,280 ft/mi) / 43,560 ft^2/ac]

3 x 2 x [(3.5% x 5,280) / 43,560 = 4 ac/yr

Over a decade, the cumulative spread off new, high risk roads is:

4 + 8 + 12 + 16 + 20 + 24 + 28 + 32 + 36 = 190 acres or ~ **200** acres

c) Based on Losensky (1987), assume that the natural rate of spread on high risk habitat types is about 1% per year. Assume 75% of the Lolo's high risk habitat is already infested by spotted knapweed. The spread on high risk sites, independent of the new road spread in b above, is:

75% x total high risk (ac) x 1%/yr for 10 years = acres per decade

75% x 71,892 x 1% per year = 5,400 @ simple interest = **5,650** acres compounded

d) Assume spread due to timber activity is limited to tractor-yarded clearcutting on moderate risk habitat types. Assume the activity level projected in the Forest Plan (overestimate--see above discussion of road activity levels). Timber-related spread is:

Projected cc acres x % moderate risk x % tractor x 10 years = decade acres

3,700 x 17.5% x 40% x 10 = **2,590** acres

e) Summing the acres derived above in items a, b, c, and d gives the total decade spread acres for spotted knapweed:

1,720 + 200 + 5,650 + 2,590 = **7,570** acres

The spread rate for the decade can be calculated as follows:

{[(current acres) + (spread acres)] / (current acres) x 100%} - 1 = spread rate

{[225,000 + 7,570] / 225,000 x 100%} - 1 = **3%** per decade

Diffuse Knapweed Spread Rate:

Assume that diffuse is at an early stage in population growth relative to spotted knapweed. Estimate an annual spread rate of 2.5%, or a decade rate of 25%.

Canada Thistle Spread Rate:

a) Infestations are limited to north-slope road right-of-ways and moist, overgrazed sites. Losensky (1987) found the plant non-persistent in the absence of disturbance. Spread rate should be relatively low.

b) 3% of the Lolo is at risk (Losensky 1987). Assume establishment on 10% of new roads. Road-related spread is:

road mi/yr x 5 ac/mi x % at risk x 10% established x 10 years = decade acres

140 x 5 x 3% x 10% x 10 = **21** acres

c) Assume Forest Plan cc level of 37,000 acres per decade, 3% at risk, and 25% of that gets infested. Timber-related spread is:

37,000 acres x 3% x 25% = **276** acres

d) The spread rate for the decade can be calculated as follows:

{(current acres) + (spread acres)] / (current acres) x 100%} - 1 = spread rate

{[1,000 + (21 + 276)] / 1,000 x 100%} - 1 = **30%** per decade

Musk Thistle Spread Rate:

This is not an aggressive plant. The ID Team, after the calculations for the previous weeds, estimates decade spread rate at 2%.

Goatweed Spread Rate:

a) This plant seems to spread quickly along roads, goes into the canopy shade beyond road right-of-ways about twice as far as spotted knapweed, and then seems to spread very little beyond that.

b) New road activity: 140 mi/yr x 5 ac/mi x 20.8% at risk x 10 yr = 1,460 ac

c) Existing road: 6,000 mi x 8 ac/mi x 20.8% at risk = 9,984 ac

d) Assume that only 1% of new and existing roads at risk will receive new introductions over the decade. Therefore, new infestations would be:

1% x 1,460 + 9,984) = **1,144** acres.

e) Spread of established infestations: Assume 0.5% of current acre estimate (0.5% x 6,400 ac) = **320** acres.

f) The spread rate for the decade can be calculated as follows:

{(current acres) + (spread acres)] / (current acres) x 100%} - 1 = spread rate

{[6,400 + (1,144 + 320)] / 6,400 x 100%} - 1 = **25%** per decade

Houndstongue Spread Rate:

Use the 4%/yr figure in Spoon and others (1983: table 1). Decade rate would be **40%**.

Leafy Spurge Spread Rate:

The ID Team estimates 10% per year, based on observations in Mormon Creek. Decade rate would be **100%**.

Tansy Spread Rate:

Use 3%/yr, rounded from value in Spoon and others (1983). Decade rate would be **30%**.

Dalmation Toadflax Spread Rate:

Use 15%/yr, rounded from Spoon and others (1983). Decade rate would be **150%**.

TREATMENT LEVELS

Determining treatment levels for each alternative involves steps 3, 4, and 5 from the list on page F-1:

3) Project infested acres at the end of ten years under no action (Alternative A) by weed species.

4) For each action alternative, set decade treatment acre targets by control method and weed species.

5) Calculate the necessary annual treatment levels by control method that would be required to meet the control targets set above.

Step 3 is relatively simple: for each weed row in Table F-1, multiply the "acres infested" column by the "10-year spread rate" column to derive the "Infested 1998" column shown below in Table F-2 (this table also appears in the DEIS as Table III-7a).

TABLE F-2:

DECADE TREATED ACRES & CHANGE IN INFESTATIONS ALTERNATIVE A:

	----	METHOD	----	TOTAL	INFESTED	% CHANGE
SPECIES	Physical	Biological	Chemical	TREATED	1998	1989-1998
Spotted Knapweed	0	0	0	0	231,750	3.0%
Diffuse Knapweed	0	0	0	0	250	25.0%
Canada Thistle	0	0	0	0	1,300	30.0%
Musk Thistle	0	0	0	0	102	2.0%
Goatweed	0	0	0	0	8,000	25.0%
Houndstongue	0	0	0	0	140	40.0%
Leafy Spurge	0	0	0	0	6,800	100.0%
Tansy	0	0	0	0	650	30.0%
Dalmation Toadflax	0	0	0	0	125	150.0%
NEW INVADERS	5	0	0	5		
Total Acres	5	0	0	5	249,117	5.2%

Given the no action acreage for each weed at the end of ten years (Table F-2), the ID Team then could estimate decade treatment targets by species and control method for each action alternative. This was done as a manual group exercise. Starting with the species-specific control objective for each alternative (Table II-8, page II-28 of the DEIS), the team determined the number of acres that would have to be treated over the decade to meet the objectives. The total treated acres were split between physical, biological, and chemical methods, based on professional judgment. The results are shown in tables F-3, F-4, F-5, and F-6 (these tables also appear in the DEIS as tables III-7b through III-7e.

TABLE F-3:

DECADE TREATED ACRES & CHANGE IN INFESTATIONS ALTERNATIVE B:

SPECIES	---- Physical	METHOD Biological	---- Chemical	TOTAL TREATED	INFESTED 1998	% CHANGE 1989-1998
Spotted Knapweed	0	0	1,000	1,000	230,850	2.6%
Diffuse Knapweed	0	0	50	50	205	2.5%
Canada Thistle	0	0	0	0	1,300	30.0%
Musk Thistle	0	0	0	0	102	2.0%
Goatweed	0	0	350	350	7,685	20.1%
Houndstongue	0	0	0	0	140	40.0%
Leafy Spurge	0	0	500	500	6,350	86.8%
Tansy	0	0	0	0	650	30.0%
Dalmation Toadflax	0	0	15	15	112	123.0%
NEW INVADERS	1	0	4	5		
Total Acres	1	0	1,919	1,920	247,394	4.5%

TABLE F-4:

DECADE TREATED ACRES & CHANGE IN INFESTATIONS ALTERNATIVE C:

SPECIES	---- Physical	METHOD Biological	---- Chemical	TOTAL TREATED	INFESTED 1998	% CHANGE 1989-1998
Spotted Knapweed	0	0	4,525	4,525	227,678	1.2%
Diffuse Knapweed	0	0	100	100	160	-20.0%
Canada Thistle	0	0	10	10	1,291	29.1%
Musk Thistle	5	100	0	105	8	-92.5%
Goatweed	0	1,050	350	1,400	6,740	5.3%
Houndstongue	25	0	25	50	95	-5.0%
Leafy Spurge	0	250	1,450	1,700	5,270	55.0%
Tansy	50	0	50	100	560	12.0%
Dalmation Toadflax	50	0	50	100	35	-30.0%
NEW INVADERS	2	0	3	5		
Total Acres	132	1,400	6,563	8,095	241,836	2.1%

TABLE F-5:

DECADE TREATED ACRES & CHANGE IN INFESTATIONS ALTERNATIVE D:

SPECIES	---- Physical	METHOD Biological	---- Chemical	TOTAL TREATED	INFESTED 1998	% CHANGE 1989-1998
Spotted Knapweed	565	0	0	565	231,242	2.8%
Diffuse Knapweed	55	0	0	55	201	0.3%
Canada Thistle	10	0	0	10	1,291	29.1%
Musk Thistle	5	100	0	105	8	-92.5%
Goatweed	0	1,050	0	1,050	7,055	10.2%
Houndstongue	50	0	0	50	95	-5.0%
Leafy Spurge	0	500	0	500	6,350	86.8%
Tansy	50	0	0	50	605	21.0%
Dalmation Toadflax	100	0	0	100	35	-30.0%
NEW INVADERS	5	0	0	5		
Total Acres	840	1,650	0	2,490	246,881	4.3%

TABLE F-6:

DECADE TREATED ACRES & CHANGE IN INFESTATIONS ALTERNATIVE E:

SPECIES	---- Physical	METHOD Biological	---- Chemical	TOTAL TREATED	INFESTED 1998	% CHANGE 1989-1998
Spotted Knapweed	0	0	24,280	24,280	209,898	-6.7%
Diffuse Knapweed	0	0	250	250	25	-87.5%
Canada Thistle	0	0	100	100	1,210	21.0%
Musk Thistle	5	100	0	105	8	-92.5%
Goatweed	0	0	3,000	3,000	5,300	-17.2%
Houndstongue	65	0	65	130	23	-77.0%
Leafy Spurge	0	500	2,900	3,400	3,740	10.0%
Tansy	50	0	150	200	470	-6.0%
Dalmation Toadflax	50	0	50	100	35	-30.0%
NEW INVADERS	0	0	5	5		
Total Acres	170	600	30,800	31,570	220,709	-6.8%

The acres shown in the above tables are for the entire decade. Converting to annual acre treatment estimates is a little complicated. Within each of the three method categories, there are two or three different specific tools (e.g. three different chemicals), each with its own effectiveness and required number of treatments per decade.

Table F-7 shows the annual treatment acres by method for each alternative. The values in this table were calculated as explained below the table.

TABLE F-7:

ANNUAL TREATMENT LEVELS BY ALTERNATIVE (ac/yr)[a]

TREATMENT	A	B	C	D	E
Physical	1	0	104	787	116
Biological	0	0	595	845	530
Chemical	0	810	2,736	0	12,617
TOTAL ANNUAL TREATMENT	1	810	3,435	1,632	13,263

[a]These annual totals are more than 1/10 the decade totals shown in the preceding tables because many control methods require that a site be treated more than once a decade. See the "(freq)" columns in tables F-8, F-12, and F-15 below.

Here's how the values in Table F-7 were calculated, using the "physical" row and the alternative "D" column as an example. Physical acres for each species in Alternative D (column 2 in Table F-5) are multiplied by the ratio and frequency columns in Table F-9 for each tool. Using the spotted knapweed row as an example:

Table F-5 Column 2	Table F-9 Col 2	Table F-9 Column 3

565 ac x (5% x 10/decade) = Grub/Pull acres (SK)

Repeating for each weed row and summing gives the annual Grub/Pull acres for Alternative D shown in Table F-8. A similar operation with rows 4 and 5 of Table F-9 gives the annual Mow/Top acres. The physical row in Table F-7 is then the sum of the Grub/Pull and Mow/Top rows of Table F-8.

Similar operations fill in the values for the biological and chemical rows of Table F-7. For the biological, substitute tables F-11 and F-12; for the chemical, substitute tables F-14 and F-15.

TABLE F-8:

ANNUAL PHYSICAL TREATMENT ESTIMATES BY ALTERNATIVE

METHOD	A	B	C	D	E
Grub/Pull	1.00	0.20	57.15	139.38	57.35
Mow/Top	0.00	0.00	47.00	647.88	58.40

TABLE F-9:

PHYSICAL METHOD RATIOS & APPLICATION FREQUENCY (per decade)

SPECIES	Grub/Pull	(freq)	Mow/Top	(freq)
Spotted Knapweed	5%	10	95%	10
Diffuse Knapweed	5%	10	95%	10
Canada Thistle	5%	5	95%	5
Musk Thistle	5%	5	95%	5
Goatweed	0%	0	0%	0
Houndstongue	5%	3	95%	3
Leafy Spurge	0%	0	0%	0
Tansy	25%	5	75%	10
Dalmation Toadflax	100%	10	0%	0
NEW INVADERS	100%	2	0%	0

TABLE F-10:

PHYSICAL TREATMENT COSTS ($/ac)

TREATMENT	Material	Milage	Labor	Contract	Total $/ac
Grub/Pull (hand)	NA	$12.00	$458.70	NA	$470.70
Mow/Top (hand)	$4.00	$12.00	$66.03	NA	$82.03

TABLE F-11:

ANNUAL BIOLOGICAL TREATMENT ESTIMATES BY ALTERNATIVE

AGENT	A	B	C	D	E
Weevil	0	0	30	30	30
Goats	0	0	315	315	0
Beetle	0	0	250	500	500

TABLE F-12:

BIOLOGICAL TREATMENT RATES AND APPLICATION FREQUENCY (per decade)

SPECIES	Insects/ac	Cost/unit	(frequency)
Musk Thsl (weevil)	2,000	$20/500	3
Goatweed (beetle)	400	$50/100	3
Leafy Spurge (goats)	NA	NA	10

TABLE F-13:

BIOLOGICAL TREATMENT COSTS ($/ac)

TREATMENT	Material	Milage	Labor	Contract	Total $/ac
Beetle (goatweed)	$200.00	$12.00	$17.38	NA	$229.38
Weevil (musk thsl)	$80.00	$12.00	$17.38	NA	$109.38
Goats (spurge)	NA	NA	NA	$100.00	$100.00

TABLE F-14:

ANNUAL HERBICIDE APPLICATION ESTIMATES BY ALTERNATIVE

CHEMICAL	A	B	C	D	E
Picloram (ac/yr)	0.00	426.78	1,462.56	0.00	6,850.88
2,4-D (ac/yr)	0.00	298.55	1,009.23	0.00	4,506.07
Glyphosate (ac/yr)	0.00	86.85	277.70	0.00	1,272.78
Picloram (lbs/yr)	0.00	213.39	731.28	0.00	3,425.44
2,4-D (lbs/yr)	0.00	597.10	2,018.45	0.00	9,012.15
Glyphosate (lb/yr)	0.00	351.74	1,124.68	0.00	5,154.74

TABLE F-15:

CHEMICAL RATIOS AND APPLICATION FREQUENCIES (per decade)

SPECIES	Picloram	(freq)	2,4-D	(freq)	Glyphosate	(freq)
Spotted Knapweed	75%	3	20%	7	5%	7
Diffuse Knapweed	70%	3	25%	7	5%	7
Canada Thistle	70%	3	20%	5	10%	5
Musk Thistle	0%	0	0%	0	0%	0
Goatweed	70%	3	20%	7	10%	7
Houndstongue	70%	3	25%	3	5%	3
Leafy Spurge	75%	3	20%	10	5%	10
Tansy	5%	3	45%	7	50%	7
Dalmation Toadflax	100%	3	0%	0	0%	0
NEW INVADERS	65%	3	20%	10	15%	10

TABLE F-16:

CHEMICAL APPLICATION RATES & COSTS

CHEMICAL	gal/ac	lbs/gal	lbs/ac	$/gal	Labor$/ac	TOTAL$/ac
Picloram (Tordon)	0.25	2.00	0.50	$82.95	$55.60	$76.34
2,4-D	0.50	4.00	2.00	$8.78	$55.60	$59.99
Glyphosate (Rodeo)	0.75	5.40	4.05	$95.00	$55.60	$126.85

COST ESTIMATES

Decade cost estimates are calculated in the spread sheet by multiplying the annual acres show for each control tool (Tables F-8, F-11, and F-14) by the per acre costs for each tool (Tables F-10, F-13, and F-16), then multiplying by 10 to convert annual cost to decade costs. The results are displayed in Tables F-17 through F-21.

TABLE F-17:

DECADE TREATMENT COSTS ALTERNATIVE A:

SPECIES	---- Physical	METHOD Biological	----- Chemical	TREATMENTS TOTAL COST
Spotted Knapweed	$0	$0	$0	$0
Diffuse Knapweed	$0	$0	$0	$0
Canada Thistle	$0	$0	$0	$0
Musk Thistle	$0	$0	$0	$0
Goatweed	$0	$0	$0	$0
Houndstongue	$0	$0	$0	$0
Leafy Spurge	$0	$0	$0	$0
Tansy	$0	$0	$0	$0
Dalmation Toadflax	$0	$0	$0	$0
NEW INVADERS	$4,707	$0	$0	$4,707
Total Costs	$4,707	$0	$0	$4,707

TABLE F-18:

DECADE TREATMENT COSTS ALTERNATIVE B:

SPECIES	---- Physical	METHOD Biological	----- Chemical	TREATMENTS TOTAL COST
Spotted Knapweed	$0	$0	$300,143	$300,143
Diffuse Knapweed	$0	$0	$15,484	$15,484
Canada Thistle	$0	$0	$0	$0
Musk Thistle	$0	$0	$0	$0
Goatweed	$0	$0	$116,581	$116,581
Houndstongue	$0	$0	$0	$0
Leafy Spurge	$0	$0	$177,582	$177,582
Tansy	$0	$0	$0	$0
Dalmation Toadflax	$0	$0	$3,435	$3,435
NEW INVADERS	$941	$0	$1,836	$2,778
Total Costs	$941	$0	$615,063	$616,004

TABLE F-19:

DECADE TREATMENT COSTS ALTERNATIVE C:

SPECIES	---- Physical	METHOD Biological	----- Chemical	TREATMENTS TOTAL COST
Spotted Knapweed	$0	$0	$1,358,147	$1,358,147
Diffuse Knapweed	$0	$0	$30,969	$30,969
Canada Thistle	$0	$0	$2,837	$2,837
Musk Thistle	$2,536	$32,813	$0	$35,349
Goatweed	$0	$722,531	$116,581	$839,113
Houndstongue	$7,609	$0	$5,608	$13,218
Leafy Spurge	$0	$250,000	$514,988	$764,988
Tansy	$60,178	$0	$32,220	$92,398
Dalmation Toadflax	$235,350	$0	$11,451	$246,801
NEW INVADERS	$1,883	$0	$1,377	$3,260
Total Costs	$307,557	$1,005,344	$2,074,178	$3,387,079

TABLE F-20:

DECADE TREATMENT COSTS ALTERNATIVE D:

SPECIES	---- Physical	METHOD Biological	----- Chemical	TREATMENTS TOTAL COST
Spotted Knapweed	$573,242	$0	$0	$573,242
Diffuse Knapweed	$55,802	$0	$0	$55,802
Canada Thistle	$5,073	$0	$0	$5,073
Musk Thistle	$2,536	$32,813	$0	$35,349
Goatweed	$0	$722,531	$0	$722,531
Houndstongue	$15,219	$0	$0	$15,219
Leafy Spurge	$0	$500,000	$0	$500,000
Tansy	$60,178	$0	$0	$60,178
Dalmation Toadflax	$470,700	$0	$0	$470,700
NEW INVADERS	$4,707	$0	$0	$4,707
Total Costs	$1,187,458	$1,255,344	$0	$2,442,801

TABLE F-21:

DECADE TREATMENT COSTS ALTERNATIVE E:

SPECIES	---- Physical	METHOD Biological	----- Chemical	TREATMENTS TOTAL COST
Spotted Knapweed	$0	$0	$7,287,469	$7,287,469
Diffuse Knapweed	$0	$0	$77,422	$77,422
Canada Thistle	$0	$0	$28,372	$28,372
Musk Thistle	$2,536	$32,813	$0	$35,349
Goatweed	$0	$0	$999,269	$999,269
houndstongue	$19,784	$0	$14,581	$34,366
Leafy Spurge	$0	$500,000	$1,029,977	$1,529,977
Tansy	$60,178	$0	$96,659	$156,837
Dalmation Toadflax	$235,350	$0	$11,451	$246,801
NEW INVADERS	$0	$0	$2,296	$2,296
Total Costs	$317,849	$532,813	$9,547,496	$10,398,158

Table F-22 shows annual treatment costs by control category for each alternative. These values are calculated simply by dividing the decade total costs for each control category (tables F-17, F-18, F-19, F-20, and F-21) by ten.

TABLE F-22:

ANNUAL TREATMENT COSTS BY ALTERNATIVE ($/yr)

TREATMENT	A	B	C	D	E
Physical	$471	$94	$30,756	$118,746	$317,849
Biological	$0	$0	$100,534	$125,534	$53,281
Chemical	$0	$61,506	$207,418	$0	$954,750
TOTAL TREATMENT COSTS	$471	$61,600	$338,708	$244,280	$1,325,880

Costs per acre treated are displayed in Table F-23. These costs do not include program expenditures, just actual treatment costs. The values are calculated by dividing the total row in Table F-22 by the total treated acres shown in tables F-2, F-3, F-4, F-5, and F-6.

TABLE F-23:

TOTAL COST PER ACRE TREATED (per decade)

	A	B	C	D	E
(Treatment only)	$94	$32	$42	$98	$42

NOTE: Does not include program costs shown below.

Table F-24 shows the annual program levels for each alternative. These are taken from the discussions of "indirect actions" in the descriptions of alternatives, DEIS pages II-11 through II-24.

TABLE F-24:

ANNUAL PROGRAM LEVELS BY ALTERNATIVE($/yr)

PROGRAM	A	B	C	D	E
Inventory	$0	$5,000	$10,000	$7,500	$60,000
Biological	$0	$7,000	$10,000	$25,000	$25,000
Information	$0	$0	$2,000	$2,000	$12,000
TOTAL PROGRAM COSTS	$0	$12,000	$22,000	$34,500	$97,000

The total annual costs shown in Table F-25 are simply the sum of the treatment totals in Table F-22 and the program totals in Table F-25.

TABLE F-25:

TOTAL ANNUAL COSTS (Treatments & Programs)

	A	B	C	D	E
(Total $/10 yrs)	$471	$73,600	$360,708	$278,780	$1,422,880

Finally, Table F-26 shows how each alternative would impact the current forest budget. The budget has been in the $14-$16 million range in the last few years. The percentages in the table are calculated by dividing the total annual costs shown in Table F-25 by the high and low end of this range.

TABLE F-26:

PER CENT OF RECENT TOTAL LNF BUDGETS ($14-$16 million)

	A	B	C	D	E
LOW ($14 million)	0.00%	0.53%	2.58%	1.99%	10.16%
HIGH ($16 million)	0.00%	0.46%	2.25%	1.74%	8.89%

Table [illegible] shows [illegible]
The budget [illegible] been in the [illegible]
The percent [illegible] are calculated [illegible]
are shown in Table 7-13 by the [illegible]

TABLE 7-13

TABLE 7-14

APPENDIX G – Human Health Risk Assessment

Appendix G

HUMAN HEALTH RISK ASSESSMENT SUMMARY

Introduction.

This appendix discusses the risk to human health associated with herbicide application projects to control noxious weeds. It is an abridged version of the summary in the Northern Region Human Health Risk Assessment (Monnig 1988), excluding discussion of chemicals that are not proposed for use in the Lolo Noxious Weeds EIS. The entire Northern Region Human Health Risk Assessment is an integral part of the Lolo analysis, and is incorporated by reference into this EIS.

Risk Assessment Methods.

Human health risk assessment has been described as a three-part process comprised of an *exposure analysis*, a *hazard analysis*, and a *risk analysis*. The exposure analysis estimates the exposure and doses of the affected populations. The hazard analysis reviews the toxic characteristics of the chemicals of concern. The risk analysis compares human doses projected in the exposure analysis to the health-effect levels determined in the hazard analysis.

In the Northern Region risk assessment, the exposure analysis is based on 5 project scenarios that are designed to encompass the range of projects sponsored by the Forest Service. Three open-range/forest projects (ground application) range in size from 1 treated acre through 40 treated acres up to large projects of 500 acres. A road right-of-way/riparian project of about 20 acres is described. In this scenario, the road is assumed to parallel a stream. The fifth scenario covered aerial application, so it doesn't apply to this EIS.

Application rates of 1 to 2 pounds of herbicide active ingredient per treated acre are projected in this analysis. The analysis assumes that herbicide is sprayed over a continuous area corresponding to the project sizes specified above. In reality, the application rates of many herbicides discussed here are lower than assumed in this analysis. The higher rates applied over the more confined areas assumed here serve to increase the estimated impacts of projects with lower herbicide application rates. For example, one-quarter pound of picloram applied per acre over 160 acres should have less impacts through drift and runoff to water than 40 pounds applied to 40 acres (assuming comparable buffers to sensitive resources).

A variety of mixing and application errors are also described that would increase estimated application rates by up to 20 percent.

In most cases, noxious weed control efforts will be far removed from human residences, thus drift impacts would be slight to nonexistent. However, no direct measurements have been made of nonworker populations in the vicinity of spray projects. Therefore, worst-case estimates are made of possible human exposures based on drift rates, dermal absorption, and other factors reported in the scientific literature. This analysis assumes that human residences are either 200 yards or 60 yards downwind of the projects and that residents are outside and exposed to drift while wearing little protective clothing. A variety of other conservative assumptions are made which increase estimated exposures from eating contaminated vegetables or cattle that have grazed on treated areas.

Worker-dose data are available for the herbicides 2,4-D, picloram, and dicamba. Worker doses for glyphosate are extrapolated from these studies based on similarities in dermal absorption rates of the herbicides. Sufficient data are available to estimate both average doses and high doses for workers. High doses would be expected 1 to 2 days out of 100. In addition, dose estimates are made for backpack sprayers who wear little protective clothing as well as those with recommended protective clothing.

Toxicology Terms.

When discussing the toxic characteristics of herbicides several toxicological terms must be defined. Important terms are discussed below as well as in a glossary at the end of the document. The **acute toxicity** of a chemical is often indicated by the one-time or short-term dose that is lethal to 50 percent of a group of treated animals. This value is abbreviated as the **LD_{50}** and is expressed as the amount of the compound (usually in grams, milligrams, or micrograms) administered per mass unit of the organism (usually in kilograms). The higher the LD_{50} the less toxic the compound.

The herbicide LD_{50} values for most species are in excess of 1,000 mg/kg which indicates relatively low acute toxicity. However, there are exceptions with some species/herbicide interactions. For example, the LD_{50} for dogs dosed with 2,4-D is 100 mg/kg.

The **chronic toxicity** of a chemical is typically determined by feeding low doses of the chemical daily for a large portion of the animal's lifetime. The animals are then sacrificed and examined for a wide variety of physiological and biochemical changes. In a properly conducted study, researchers can define a **no-observed-effect level (NOEL)** which is the highest dose level that does not affect organism health or well-being over the duration of the test.

In addition to studies of general systemic effects, more specialized studies probe the chemical's ability to disrupt animal reproductive functions or to cause **fetotoxic** or **teratogenic effects** (gross malformations) in offspring. Feeding studies can be conducted over several generations of animals. Pregnant animals can also be given high doses during critical times of pregnancy to test for teratogenic effects.

For many people, exposure to pesticides raises the specter of cancer or heritable mutations (alterations in genetic material that can be passed to succeeding generations as a "birth defect"). **Carcinogenic** potential can be tested in **chronic oncogenicity** (tumor) studies. Tests for **mutagenic** potential involve a variety of tests ranging from simple cellular organisms to mammalian studies. However, considerable scientific uncertainty exists as to what constitutes sufficient evidence of mutagenicity or carcinogenicity and the extent to which these herbicides constitute a threat to human health.

This analysis assumes as a worst case that a herbicide could cause cancer if any test evidence of carcinogenicity exists. The analysis also assumes that any dose of a carcinogen carries with it a probability of carcinogenic effect and that this probability increases with increasing dose. Thus, the analysis assumes that there is no absolutely safe dose of a carcinogenic compound.

Data Gaps.

A major issue in the Forest Service development of risk assessments to meet NEPA regulations has been the existence of **data gaps** on the health effects of herbicides. The U.S. EPA regulations for the registration of a pesticide for use on food require chronic and oncogenicity feeding studies on at least three animal species, in addition to a variety of tests for teratogenicity, reproductive effects, and mutagenicity. When all the data

requirements for final registration have not been met, a pesticide can nonetheless receive a conditional registration provided there is no evidence of unacceptable risk to human health or the environment from its continued use. The critics of pesticide registration process often view this as a significant flaw in the system since it requires that EPA prove that the pesticide is unsafe rather than requiring that the manufacturer complete testing prior to use. In defense of the manufacturers, it should be noted that EPA has only recently issued final registration regulations. For most of the pesticides discussed here, a considerable body of test data exists, although all final test requirements may not be met. All of the pesticides discussed here are conditionally registered.

The registration data gaps vary in their significance for a human health risk assessment. Glyphosate has met most of the registration data requirements, although the U.S. EPA has recently asked for additional data to clarify issues raised by a recent cancer study that showed a weak cancerous effect. Major chronic feeding studies with the herbicides 2,4-D and picloram are currently being reviewed by the EPA.

Although the Forest Service spends approximately $800,000 per year through the National Agricultural Pesticide Impact Assessment Program on research projects to increase understanding of pesticide impacts, these funds are not sufficient to fill many of the health effects data gaps identified above. A chronic feeding study, for example, typically exceeds $1 million in cost. In addition, the herbicide manufacturers are under mandate by EPA to fill those data gaps. In the interim, worst case assumptions have been used where data is unavailable and unobtainable.

Toxicity.

Sections 2.5 and 2.7 of the Northern Region Risk Assessment (Monnig 1988) review in detail the toxicity data available on these herbicides. The NOELs used in this analysis range from 1 milligram/kilogram/day for 2,4-D to 10 mg/kg/day for glyphosate; 2,4-D, glyphosate, and picloram are assumed to be carcinogens.

Regardless of the status of health effects tests designed to meet EPA registration requirements, a major source of uncertainty is the extrapolation of the results of animal tests to humans. In order to compensate for the uncertainty of extrapolating from animals to humans, the EPA defines the **acceptable daily intake (ADI)** of a pesticide by dividing the NOEL for the species most sensitive to the pesticide by a safety factor. Safety factors of 100 are typically used when adequate chronic feeding studies are available. This risk assessment compares worker doses and combinations of general population doses to the NOEL and ADI levels to determine the significance of these doses.

The comparison with ADI's will tend to overstate the possible impacts of Forest Service spraying since resulting exposures tend to be short-term, whereas the ADI assumes a lifetime of such doses.

The carcinogenic potential of herbicides to humans is extrapolated from animal studies by use of conservative model that tends to overestimate possible impacts. This estimate of the possible cancer impacts on humans is uncertain because of the differences between test animals and humans and the extrapolation of the results of high-dose animal studies to the low doses experienced by humans.

The final issue we will discuss in this section on herbicide toxicity is the bioaccumulation and biomagnification of pesticides in the environment. Much evidence exists of environmental damage by pesticides such as DDT, endrin, dieldrin, etc., which readily bioaccumulate in the environment and can damage organisms high on the food chain such as raptors (hawks, eagles, etc.) and possibly humans. Concern is expressed that the widespread use of these herbicides could have similar effects.

Bioaccumulation or biomagnification of the herbicides analyzed here is not possible. A chemical can bioaccumulate significantly only if it is persistent (that is, it does not degrade quickly) and it is insoluble in water (or conversely, high in lipid or fat solubility). Fortunately most of these herbicides are quite soluble in water and are excreted quickly by organisms. Although ester forms of 2,4-D are soluble in organic solvents indicative of lipid solubility, they degrade very rapidly in the environment and are excreted quickly by organisms. In summary, extensive testing of these herbicides indicates no significant bioaccumulation or biomagnification.

Comparison of ADI's and NOEL's with General Population Doses.

Relatively low risk exists for the general public from herbicides widely used for noxious weed control. With but few exceptions discussed below, the worst-case doses to maximum-exposed members of the general population are all below ADI values.

The NOEL/dose and ADI/dose comparisons for these herbicides show that the exposure with the highest risk to the general public would involve consumption of wild food from a spray site. The dose comparisons show that a visitor to National Forest System lands can receive a dose that exceeds the ADI's if he or she collects and consumes a large quantity of sprayed, unwashed vegetation. For numerous reasons, there is a very low probability of this event. Very little land would actually be sprayed for noxious weeds (at most, 0.6 percent of the Lolo National Forest per year under Alternative E). The targeted vegetation is not edible and berry bushes and other prime food-gathering areas generally do not occupy the same habitats that are infested with noxious weeds or poisonous plants. Finally, the appearance, odor, and taste of the sprayed vegetation would significantly reduce palatability of wild foods. Nonetheless, the calculated worst-case doses indicate that even if these improbable events were realized, the dose would be from 20 to 384 times less than the herbicide NOEL's based on long-term feeding studies.

The maximum estimated dose to an adolescent who spends the the day in the vicinity of a right-of-way spray project could exceed slightly the ADI for the herbicide 2,4-D. This dose would be about 95 times lower than the NOEL based on long-term dosing studies. Since the adolescent dose would occur at most only once at the levels predicted, health effects would be unlikely.

Although most doses to the general public are well below NOEL and ADI levels based on animal tests, it is possible that a small percentage of the human population may be very sensitive to chemical exposures. For example, the medical literature has reported several cases of peripheral neuropathy resulting from exposure to 2,4-D. Peripheral neuropathy is the disruption of the nervous system characterized by some or all of the following symptoms: numbness in hands and feet, loss of balance, aching in extremities, fatigue, and nausea. Recovery in some cases is very prolonged and may not be complete even after several years.

Although most of the reported cases of peripheral neuropathy occurred after massive doses, effects in some people have been noted at much lower apparent doses. The conclusions of Berkley and Magee (1963) seem appropriate.

> Despite the extensive use of 2,4-D preparations, resultant peripheral neuropathy is very rare, and an affected individual probably has some predispositon to neuropathy or susceptibility to the toxin. Nevertheless, as it cannot be determined who is predisposed or susceptible, and as no antidote to 2,4-D intoxication is known, prevention is simpler than treatment.

It is also possible that idiosyncratic responses as yet undetected by the medical community could result from the exposure to other herbicides or combinations of herbicides. Once again, prevention of exposure for both workers and the general public is the most prudent course.

Comparison of ADI's and NOEL's with Worker Doses.

In general, of the various populations exposed to pesticides, the workers applying herbicides incur the highest risk of health impacts. The workers with the highest potential exposure are backpack sprayers. This section will summarize the trends in worker doses for each herbicide.

2,4-D. All worker dose estimates for backpack applicators and truck applicators are above the ADI for 2,4-D. Backpack-applicator doses range from as little as one-third the NOEL levels to 24 times less than the NOEL. At dose levels above the NOEL, changes in kidney function in test animals were observed with as little as 90 days dosing. Tests on the reversibility of the changes in kidney function have not been conducted. Backpack applicators are at some risk of effects on kidney function. Application techniques and the use of rubber gloves, rubber boots, and long-sleeved shirts can reduce this impact.

The dose estimates for truck applicators are lower than backpack applicator dose estimates, thus the risk of kidney effects is lessened although not completely eliminated. For all worker functions, there exists the possibility of neuropathological effects as described above in the general population section.

Worker doses (backpack applicators and truck applicators) range from 80 times less under the fetotoxic NOEL under low protection scenarios to 675 times less under recommended protection scenarios.

Glyphosate. Except for the high dose estimate for backpack applicator under the low protection scenario, all worker dose estimates are below the ADI for glyphosate.

Picloram. Picloram is similar to glyphosate in that all worker dose estimates are below the ADI except the highest dose estimate under the low protection backpack applicator scenario. The NOEL for general systemic effects is about 226 times higher than this high-dose estimate.

Risk of Cancer and Mutation.

Based on extensive testing of a large number of both synthetic (man-made) and naturally occurring chemicals, it is apparent that carcinogens vary widely in their potency. Nor is there a reliable or universal difference in the carcinogenic potential of either "natural" or "synthetic" chemicals. For example, over a lifetime a daily dose of about 2 micrograms of aflatoxin B1 is sufficient to give 50 percent of test rats cancer. Aflatoxin B1 is a naturally occurring compound in milk, peanut butter, cornmeal, and other foods. By contrast, it requires daily doses of approximately 1 million micrograms of saccharin to induce cancer in 50 percent of test animals.

Although cancer-causing chemicals can vary tremendously in their cancer potencies, it is not known if there are "cancer NOEL's" – that is, dose levels that are absolutely free of cancer risk. If million-microgram daily doses give 50 percent of test animals cancer, and half-million microgram daily doses give 10 percent of animals cancer, what can we say with certainty about 10 microgram doses? Not much, it turns out. It is possible that if a million animals were dosed daily with 10 micrograms of Chemical X, one or two animals might develop cancer as a result of these low doses. Since we have no way of testing a million animals, we cannot resolve the issue given the current state of science. In the face of this uncertainty, this risk assessment assumes that any dose of a carcinogen above zero carries with it a possibility of causing cancer. For low doses of weak carcinogens, this possibility is often expressed as the chance of developing cancer. For example, if a particular dose is said to

bring a five-in-a-million chance of cancer, it is equivalent to saying that if a million people received the dose we would expect five to develop cancer.

For the herbicides glyphosate, picloram, and 2,4-D scientific uncertainty exists regarding their carcinogenicity. Animal feeding studies conducted to date indicate that carcinogenic effects, if any, are weak. The cancer potencies of these herbicides are on the order of saccharin. For example, at the highest dose levels in which 3 percent of the test animal diet was glyphosate, only three of 50 male rats developed cancer and no females developed cancer.

In addition to animal feeding studies, numerous epidemiology studies have been conducted on phenoxy herbicides including 2,4-D. Epidemiology is the study of the relative rates of disease in populations that have been exposed at different levels to potential disease-causing agents. A recent National Cancer Institute (NCI) study of farm worker exposure to various herbicides reports that farmers who were exposed to phenoxyacetic acid herbicides (including 2,4-D) were about twice as likely as nonfarmers to develop Non-Hodgkins Lymphoma (NHL), a rare form of cancer (Hoar and others 1986). Farmers who used personal protective measures were about 1.4 times as likely as nonfarmers to develop NHL. Farmers who did not protect themselves were about 2.1 times as likely as nonfarmers to develop NHL. Farmers who were exposed to phenoxyacetic acids over 20 days per year increased their odds of NHL sixfold. Farmers who were exposed over 20 days per year and did their own mixing and loading showed an eightfold increase. The NCI study found no increase in NHL rates in farm family members who were not actively involved in herbicide applications.

Some findings of this study were inconsistent. For example, although farmers with increased exposure days per year had increased rates of NHL, there was no relation between increased acres sprayed per year and increased NHL rates. Likewise, an increase in the number of years of spraying was not associated with an increase in NHL rates. These inconsistencies may be reconciled by additional ongoing studies currently being conducted by the NCI.

At the present time EPA has not initiated a special review of 2,4-D based on the NCI findings. EPA has noted that several epidemiology studies have not replaced the positive findings of the NCI study. On the other hand, it should be noted that several European epidemiology studies of workers exposed to a variety of chemicals including 2,4-D have found associations with cancers in addition to NHL. While ongoing studies are not completed, the epidemiologic findings to date and the results of animal testing studies certainly argue, at a minimum, for care in the use of 2,4-D to reduce exposure.

Based on the extrapolation of the results of animal cancer studies to humans, it is again apparent that workers are at highest risk. A lifetime of 2,4-D exposure (assuming 30 days of application per year for 30 years) could increase the worker's chances of getting cancer by about five chances in 100,000. Since the average American has about one chance in four of cancer regardless of herbicide exposure, this cancer increase is still rather small. Picloram and glyphosate are 10 to 100 times less potent carcinogens than 2,4-D based on animal feeding studies. Thus, comparable doses would result in proportionately less cancer risk.

Cancer risks to members of the general public are 100 to 1,000 times less than the risk to workers when considering exposure to the same herbicide. Risks on this order could not be detected by epidemiology studies as conducted by the National Cancer Institute. As noted above, the NCI study did not find increased cancer in farm family members that were not actively involved in pesticide application.

Finally, for comparison, Tables G-1 and G-2 present the risk of death or cancer from a variety of other activities Americans engage in.

TABLE G-1. Lifetime risk of death or cancer for some everyday activities.[1]

Activity	Time to accumulate a one-in-a-million risk of death	Average annual risk per capita
LIVING IN THE UNITED STATES		
Motor vehicle accident	1.5 days	.0002
Falls	6 days	.00006
Drowning	10 days	.00004
Fires	13 days	.00003
Firearms	36 days	.00001
Electrocution	2 months	.000005
Tornados	20 months	.0000006
Floods	20 months	.0000006
Lightning	2 years	.0000005
Animal bite or sting	4 years	.0000002
OCCUPATIONAL RISKS		
GENERAL		
manufacturing	4.5 days	.00008
trade	7 days	.005
service & government	3.5 days	.0001
transport & public utilities	1 day	.0004
agriculture	15 hours	.0006
construction	14 hours	.0006
mining & quarrying	9 hours	.001
SPECIFIC		
coal mining (accidents)	14 hours	.0006
police duty	1.5 days	.0002
railroad employment	1.5 days	.0002
fire fighting	11 hours	.0008
HERBICIDE SPRAYING[2]		
2,4-D	137 days	
picloram	11,236 days	
glyphosate	41,667 days	

[1]From Crouch and Wilson (1982)

[2]Assumes backpack spraying, average dose, and recommended protective equipment and procedures (Monnig, personal communication).

TABLE G-2: Other One-In-A-Million Risks[1]

Source of risk	Type and amount of exposure
Cosmic rays	One transcontinental round trip by air; living 1.5 months in Colorado compared to New York; camping at 15,000 feet over 6 days compared to sea level.
Eating & drinking	40 diet sodas (saccharin) 6 pounds of peanut butter (aflatoxin) 180 pints of milk (aflatoxin) 200 gallons of drinking water from Miami or New Orleans 90 pounds of broiled steak (cancer risk only)
Smoking	2 cigarettes
Other	20 days of sea level natural background radiation; 2.5 months in masonry rather than wood building; 1/7 of a chest x-ray using modern equipment.

[1]From Crouch and Wilson (1982)

Cumulative and Synergistic Effects and Inert Ingredients.

The possible interaction of pesticide active ingredients with other chemicals in the environment has been raised as an issue. Of particular concern is the possibility of synergism, a special type of interaction where the combined effect of a specific herbicide with one or more chemicals in the environment (such as pollutants) would be greater than the sum of the individual effects of the herbicide and chemical(s) (in other words, 2 + 2 are greater than 4).

A classic study of the synergistic effects of pollutants examined the interactive effects of asbestos exposure and smoking. This study found that inhalation of cigarette smoke and asbestos resulted in an eightfold increase in lung cancer over nonsmokers exposed to asbestos. Studies such as these, however, have limitations because high doses are required to discover effects and the relevance to low-level exposures is uncertain.

In the process of formulating pesticides for commercial use a variety of surfactants, emulsifiers, diluents, and other so-called inert ingredients may be added. The toxicological properties of these additives have come under increased scrutiny. EPA has issued two lists of inerts requiring further regulation or testing. The first list of about 55 chemicals groups the "Inerts of Toxicological Concern", and a second list of 60 chemicals are "Potentially Toxic Inerts/High Priority for Testing."

Some formulations of 2,4-D contain petroleum distillates which is a class of chemicals found on List 2. Analysis of the health risk of these petroleum products indicates that these inerts pose less risk than the active ingredients. Tests of the acute toxicity of pesticide formulations support this contention. The LD_{50} values for the pesticide formulations are typically higher than those of the active ingredient, indicating that the formulations are less toxic. Unfortunately, chronic tests of pesticide formulations are not available and interactive effects on cancer rates or other health effects cannot be ruled out absolutely.

In summary, then, what can be said concerning the issue of synergistic and cumulative effects of herbicides used in the Forest Service herbicide weed control programs?

First, the additive impact of Forest Service spraying relative to the effects of the private application of herbicides will be very small. For example, a worker or farmer who sprays herbicides on non-Forest Service projects and is also a resident in the vicinity of Forest Service projects might expect, under worst-case conditions, an increase in herbicide dose of about 1 percent over his worker dose. Typically, the increase would not be measurable.

Second, the total doses to members of the general public from all sources of herbicides are unlikely to be higher than those estimated in these analyses. The dose to maximum-exposed residents assumed that the greatest portion of their diet came from spray-impacted foodstuffs. Any substitution of food from other sources (i.e., food markets) would lessen the dose. The herbicides involved in these analyses have not been found widely in market foodstuffs. For example, a market-basket analysis by the Natural Resources Defense Council (NRDC) of a variety of fruits and vegetables found no 2,4-D in any food sample.

Although the NRDC found other pesticides in some foodstuffs, the interactive effects would be suspected to be small for maximum-exposed residents. Dr. Bruce Ames, an eminent toxicologist from the University of California at Berkeley, has pointed out that there are many naturally occurring chemicals in the food that people eat that are teratogenic, mutagenic, and carcinogenic, and which are consumed at doses 10,000 times higher than man-made herbicides (see discussion in Ames 1983). Therefore, the low, short-lived doses to maximum-exposed residents that result from spraying of these herbicides are very small compared to many other chemicals in the environment. For these small comparative doses, a synergistic effect is not realistically expected.

Major Accident Scenarios.

An examination of accident records for the past 10 years reveals no major accidents involving herbicide application projects. The possibility of accidents in the future cannot be completely discounted, however.

Several accident types including spills of concentrated herbicide formulations onto people or into drinking water reservoirs are reviewed. Spills of concentrate onto people could cause acute effects including nausea, trembling, headache, etc., depending on the degree of exposure, time to cleanup, and individual factors.

Spills into drinking water reservoirs would present less risk to individuals primarily because relatively little herbicide is carried at any one time and any spilled amounts would be quickly diluted. Two reservoir sizes were modeled. Concentrations in the larger reservoir would never be high enough to exceed ADI levels. Within a day in the smaller reservoir, levels would be below levels exceeding the ADI for water consumers.

GLOSSARY.

ACCEPTABLE DAILY INTAKE (ADI): The maximum dose of a substance that is anticipated to be without lifetime risk to humans when taken daily.

ACID EQUIVALENT (A.E.): The amount of active ingredient expressed in terms of the parent acid.

ACTIVE INGREDIENT (A.I.): The pesticide compound or toxicant which produces the desired effect of the formulation. Pesticide formulations are typically 1 to 50 percent active ingredient; the remainder being carriers, solvents, emulsifiers, etc.

CARCINOGEN: Any cancer-producing substance.

CARRIER: Material added to an active ingredient to facilitate its preparation, storage, shipment, or use.

CHRONIC TOXICITY: The poisoning effects of a series of small doses applied over a long period.

CONCENTRATION: The amount of active ingredient or acid equivalent in a quantity of diluent, expressed as lb/gal, ml/liter, etc.

DERMAL EXPOSURE: The contact of a chemical with skin.

DOSE: A given quantity of test material that is taken into the body; quantity of material to be administered.

EMULSIFIABLE CONCENTRATE: A liquid formulation obtained by dissolving the technical active ingredient in a liquid solvent and adding one or more emulsifiers, so that the formulated pesticide can be further diluted with water or oil for spray application.

EXPOSURE: Application of test material to the external surfaces of a test organism; takes into consideration route, duration, and frequency.

FETOTOXIC: Capable of producing adverse effects in a developing fetus.

FORMULATION: (1) A pesticide preparation supplied by a manufacturer for practical use. (2) A manufacturing process by which technical active ingredients are prepared for practical use by mixing with liquid or dry diluents, grinding, or by the addition of emulsifiers, stabilizers, and other adjuvants.

HERBICIDE: A chemical used to control, suppress, or kill plants, or to severely interrupt their normal growth processes.

LC: Lethal concentration.

LC_{50}: The median lethal concentration; the concentration of toxicant necessary to kill 50 percent of the organisms being tested. It is usually expressed in parts per million (ppm).

LD_{50}: The median lethal dose; the size of a single dose of a chemical necessary to kill 50 percent of the organisms in a specific test situation. It is usually expressed in the weight of the chemical per unit of body weight (mg/kg). It may be fed (oral LD_{50}) or applied to the skin (dermal LD_{50}).

MUTAGENIC: Capable of inducing a mutation. An agent (change in hereditary material) that tends to increase the occurrence or extent of mutation.

NOEL: In a series of dose levels tested, it is the highest level at which no effect is observed (no-observed effect level).

NONTARGET VEGETATION: Vegetation which is not expected or not planned to be affected by the treatment.

ONCOGENIC (TUMORIGENIC): Capable of producing or inducing tumors in animals. The tumors may be either malignant (cancerous) or benign (noncancerous).

PESTICIDE: As defined by U.S. EPA, any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

PHEROMONE: Any substance secreted by an animal which influences the behavior of other individuals of the same species.

RATE: The amount of active ingredient or acid equivalent applied per unit area or other treatment unit.

RESIDUE: That quantity of herbicide, its degradation products, and/or its metabolites remaining on or in the soil, plant parts, animal tissues, whole organisms, and surfaces.

RISK: The probability that a substance will produce harm under specified conditions.

SAFETY: The reciprocal of risk, i.e., the probability that harm will not occur under specified conditions.

SPOT TREATMENT: A herbicide applied over a small continuous restricted area of a whole unit; i.e., treatment of spots or patches or brush within a larger field.

SUBCHRONIC TOXICITY: Effects of regularly repeated doses or exposures over periods ranging from a few days to several months.

TERATOGEN: Any substance capable of producing structural abnormalities of prenatal origin, present at birth or manifested shortly thereafter (the ability to produce birth defects).

TOXICITY: The capacity or property of a substance to cause any adverse effects. It is based on scientifically verifiable data from animal or human exposure tests.

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APPENDIX H – Ecological Risk Background Material

Appendix H.

ECOLOGICAL RISK BACKGROUND MATERIAL

This appendix contains background material used to analyze the risks of weeds and herbicides to soil, water, wildlife, and fisheries resources on the Lolo National Forest. It includes five main sections:

SOIL AND WATER HERBICIDE EFFECTS

This section is an edited version of an appendix in the Vegetation Management EIS for the Southern Region of the Forest Service (Neary and Michael 1988). Deletions and revisions were made to tailor this paper to the Lolo National Forest Noxious Weed Management EIS.

The purpose of this section is to review the effects of herbicides on soil productivity and water quality. This is accomplished by discussion of herbicide characteristics, applications, and environmental interactions as they influence effects on soil productivity and surface and ground water quality.

HERBICIDE USE

Forestry herbicides can affect non-target plants and animals, and surface and ground water quality at several stages in the use cycle. These stages consist of (1) storage, (2) transportation, (3) loading and mixing, (4) application, (5) equipment cleanup, and (6) container disposal. During and after application, herbicide residues usually move onto the landscape in a diffused nonpoint source pattern. It is during this phase that most public concerns for non-target organisms and water quality arise. The other 5 stages of herbicide use usually deal with concentrates which constitute potential point sources of environmental pollution. These stages have historically caused the most environmental problems. A number of publications are available which discuss safe handling of herbicides during all phases of chemical use (Neary and Taylor 1984; Singer 1980; USDA-USEPA 1975).

Most environmental fate and impact studies conducted on forestry herbicides have focused on off-site movement during and after application. It is during this stage of herbicide use that most adverse public reactions and concerns for environmental quality occur. The bulk of this paper will deal precisely with this aspect. However, references will be made to problems with concentrated materials.

Ecosystem Fate

When herbicides are applied to forest ecosystems, a number of processes affect the environmental fate and impact of these chemicals. Understanding these processes is important to determining the environmental impact of herbicide use in vegetation management programs. To reach such an understanding, we must consider the important zones and processes involved in herbicide application, movement and transformation. The key environmental zones are the atmosphere, above-ground vegetation, soil surface, soil rooting zone, unsaturated zone below the rooting depth, and ground water.

Herbicides and their breakdown products are transported within ecosystems mainly through the water cycle. Precipitation, evaporation, runoff, leaching, and root uptake are the major water pathways. Within the unsaturated and saturated soil zones and geologic strata, movement can be lateral, upward, or downward. These processes, as they operate in forested watersheds, are discussed in great detail by Hewlett (1982), Anderson and others (1976), and Crossley and Swank (1987). Runoff, leaching, root uptake, and movement in soil and ground water are the primary hydrologic processes governing herbicide movement. Precipitation and evaporation are the principal driving forces in the water cycle.

A variety of processes occur within the environmental zones which affect the gain or loss of herbicide residues within the system The importance of these processes on any given site is determined by individual herbicide characteristics, climatic factors, soil-water properties, and indigenous organisms. These processes have been analyzed and discussed in considerable detail (Hance 1980; Grover 1988). The purpose of the discussion here is to give the reader an overview of these key environmental fate processes.

Herbicide Characteristics

The important characteristics which distinguish herbicides and their potential effects on the environment are listed in table 1. Formulation, solubility, and vapor pressure are the key physical characteristics of herbicides which affect environmental fate. The other characteristics listed in this table involve interactions with the environment and are discussed later.

Table H-1: Important environmental characteristics of 2,4-D, glyphosate, and picloram

Herbicide	Solubility 25° C (ppm)	Half-Life[1] (days)	Photo-Degradation	Microbial Degradation	Hydrolysis	Volatility	Adsorption Coefficient
2,4-D	3,000,000[2]	28	Minor	Yes	Yes	Yes[4]	0.5
Glyphosate	12,000	61	Minor	Yes	No	Low	16.5
Picloram	430,000[3]	63	Yes	Yes	Yes	No	0.6

[1]Average half-life
[2]Amine salt formulation
[3]Water solubility for potassium salt
[4]Formulated product

The formulation of a herbicide consists of the active ingredient and inert carrier materials. Chemical manufacturers mix these materials into their trade formulation to provide easy application and efficient weed control. Variations in formulations can be due to changes in either the active ingredient or the inert materials. The whole range of formulations have been discussed in detail (Sassman and others 1984). The inert carrier materials are "inert" only with regard to their herbicidal properties. They range from clay to petroleum solvents. Like all chemicals, their effects on plants and animals can vary. Formulations are important since changes by individual chemical manufacturers can affect the other two physical characteristics, solubility and vapor pressure. The most commonly used forestry herbicide formulations are liquid concentrates, wettable powders, granules, pellets, emulsifiable concentrates, and soluble powders (Neary 1985b). The type of formulation for a particular herbicide also affects the application system and the potential for off-site movement.

Herbicide formulation can directly affect solubility. An example is 2,4-D; the dimethylamine salt of 2,4-D is totally water soluble while the butoxyethanol ester of 2,4-D is essentially insoluble in water (WSSA 1986). The solubility of herbicide active ingredients in water is also one index of potential for off-site movement. In general, herbicides with high water solubility have the greatest potential to move by storm runoff into streams and lakes or by deep leaching into an aquifer. Some exceptions occur when herbicides interact strongly with the soil chemical/biological system. 2,4-D is fairly soluble, picloram is very soluble, and glyphosate is an exception to the solubility—transport rule-of-thumb. Although glyphosate is readily soluble in water, its potential to move is very low since it is strongly adsorbed onto organic matter in the soil.

Most of the forestry herbicides have low vapor pressures and thus are not prone to volatilization losses (some formulations of 2,4-D are volatile, but the formulations used by the Forest Service have heavier molecular weights and a relatively low volatility (Sassman and others 1984)).

Application

Application systems for forestry herbicides are discussed in some detail in the Northern Region Risk Assessment (Monnig 1988) and elsewhere (Cantrell 1985; Miller and Williamson 1987). The environmental effects of herbicides are influenced strongly by application conditions including placement, system, formulation, rate, timing, and buffers. Other things being equal, it is mainly the prescription, application, and execution which determine the severity of environmental impacts. There are almost infinite combinations of these factors to consider. Our purpose is to briefly discuss some of the important concepts and comparisons.

PLACEMENT: Herbicides can be placed on the foliage or stems of target plants, on the soil, or injected directly into stems. Foliar application generally involves a greater hazard because herbicides are spread through the air. They can be moved around by aerial drift, washed off plant leaf surfaces, or physically dislodged. Soil applications may result in a lower hazard of off-site movement, but introduce additional problems of runoff and leaching. Soil-active herbicides usually do not enter the target plants as rapidly as foliar ones. Drift potential is reduced to near zero if solid formulations are used. Injection is not considered in this EIS.

SYSTEMS: Various herbicide-application systems are commercially available (Cantrell 1985). The choice of system affects the potential environmental impact and fate of a herbicide. For instance, ground spray systems are not subject to the same drift problems as aerial ones although drift can still occur. The type of nozzles selected for spray equipment and the operating pressure of the system directly affect droplet size, distribution pattern and drift potential. These factors are most important in aerial application, which is not considered in this EIS.

FORMULATIONS: Differences in the chemical properties of different liquid formulations can affect environmental fate and movement.

RATE: Herbicide application rate strongly affects environmental impact and fate. Rates in this EIS vary from 1/2 to 5 lb/ac active ingredient, depending on the herbicide and target vegetation. Obviously, with a low rate of herbicide application, residues will dissipate faster, potential exposure of non-target organisms will be lower, and the amount of chemical available for off-site transport into surface water or ground water will be less. Selecting herbicides which will effectively control target weeds at low application rates reduces potential adverse environmental impact.

TIMING: Timing of herbicide applications in relation to climatic conditions and the growing condition of vegetation is important. Often timing is the difference between safe and unsafe use of the same herbicide. This difference can be a matter of seasonal, daily, or hourly timing. Application of a highly soluble herbicide during a dry period with few and low intensity storms presents a far different hazard to water quality than during a rainy season. The same contrast occurs between clear versus rainy or foggy days. Herbicide applications during early morning hours with light winds, or mid-day when winds are gusty, present two different hazard levels.

BUFFERS: The presence and size of buffers has a large effect on the potential impact of herbicides on water quality. Buffers are used as a mitigation measure to reduce or prevent herbicide movement into water. The size of buffer needed is a function of the chemistry of each herbicide, the application system, and the sensitivity of the water resource.

Disappearance of Herbicide Residues

Once a herbicide is applied to a site, it is subjected to natural processes eventually resulting in its disappearance. The herbicides initially are retained on-site by being deposited on foliage and litter surfaces, or adsorbed onto soil surfaces. Their disappearance is a combination of two groups of processes, transport and degradation.

RETENTION PROCESSES: These processes are important in assuring either that the herbicide gets to its target or is kept on the treated site. Foliar penetration is a key process in getting herbicides through the waxy leaf surface and into the target plant. There are many kinds of adjuvants or herbicide formulations which aid this process. Once herbicides enter the soil, adsorption is an important process. Organic matter content is very important in determining adsorption as it relates directly to the soil's ability to retain chemical residues. The higher the organic matter content of the soil the greater the potential to retain herbicide residues.

TRANSPORT PROCESSES: Herbicide transport processes include drift, foliar and stem washoff (also physical dislodgment), volatilization, plant uptake, leaching, surface runoff, and subsurface flow. Through these processes, herbicides move within a treated area and from target vegetation to water or non-target organisms. All these movement processes are affected by a complex set of chemical, physical, climatic, hydrologic, edaphic, and biologic factors.

Drift is the movement of herbicides in air as suspended droplets or dust. Rainfall can cause foliar and stem washoff after herbicide application, removing herbicide residues from plant surfaces and transporting them to the soil. Volatilization occurs while herbicides are still exposed to sunlight and air, and involves chemical movement in the vapor phase in air. Plant uptake removes herbicides from foliage and bark surfaces or from the soil, and temporarily or permanently, depending on the herbicide, removes them from transport. Leaching moves herbicides through litter, soil, and out of the plant rooting zone. Surface runoff rapidly transports residues off-site either in solution or adsorbed to sediment. Subsurface flow of water removes herbicides in solution from the treatment site in slower ground water flow.

DEGRADATION PROCESSES: Processes that break down herbicide chemical structures include photodecomposition, microbial and plant metabolism, thermal degradation, and hydrolysis. These processes, along with those that transport herbicides, determine the degree to which a herbicide persists in the environment. Herbicide persistence is advantageous for controlling target vegetation, but can be a disadvantage because of movement off-site or toxicity to subsequently seeded or planted vegetation.

Some herbicides readily photodegrade, some do not, and some do so only in water. There are many micro-organisms in the soil that can utilize herbicides as energy sources and break down these chemicals into simpler structures. In addition, plants can alter herbicide structures while the herbicides are affecting the plant's physiology. Herbicides are also degraded into simpler compounds by physical-chemical processes like hydrolysis.

SOIL PRODUCTIVITY

ISSUE: One concern about herbicide use is their long-term effect on soil productivity. Does introduction of synthetic chemicals into the forest vegetation and soil system produce adverse, advantageous, or neutral changes? This question can be answered, in part, by examining tree growth responses, erosion effects, and soil micro-organism impacts.

Tree Growth

Studies have demonstrated that herbicide use can have a beneficial effect on conifer growth, particularly in the South (Neary and Michael 1988). In the Northwest, studies have found both beneficial and negative effects on conifer growth, both of which are overshadowed by climatic effects (Boyd 1985a). Positive effects of herbicides are related to reduction in internal seedling stress from the removal of other plants competing for moisture and nutrients. Negative effects include increases in root disease due to dead vegetation, and increased tree mortality caused by rodents when alternate food sources are destroyed by herbicides (Boyd 1985b).

Erosion

Erosion and soil dislocations within sites have been identified as potential negative impacts on future forest productivity in the Northwest. The litter and surface soil horizons are crucial for the maintenance of site productivity. The bulk of the nutrients that promote good tree growth are found in these surface layers. Any activities which remove or redistribute these horizons will be potentially damaging to forest productivity. Mechanical activities are the major factors that disturb these soil layers.

Herbicide use for weed control, even in steeper terrain, causes very little erosion and maintains good hydrologic conditions. Herbicides do not disturb the soil and usually leave a good litter layer which mitigates raindrop impact, promotes infiltration, and greatly reduces erosion. After examining erosion from a variety of site preparation techniques and locations in the Northwest, it is evident that herbicide use results in sediment yields more similar to undisturbed watersheds than mechanically prepared ones.

Evidence on erosion clearly points to the benefits of herbicide use in forestry. This is true first from the viewpoint of reducing adverse site productivity by maintaining scarce nutrients. It is also true regarding water quality impacts. For instance, in the South where sediment is the biggest water quality problem in the region (Larsen and others 1983), herbicides show a very positive effect (Neary and others 1986).

Soil Organisms

Does herbicide use adversely affect soil flora and fauna? Certainly the removal of a live vegetation canopy has significant effects on the thermal and moisture regimes of the forest floor and soil horizons. But the resulting changes in soil organisms are due more to physical than chemical effects (Mayack and others 1982).

The micro- and macro-organisms found in the forest floor and soil horizons play very important roles in the functioning of forest ecosystems. They are important in processes such as organic matter decomposition, nutrient mineralization, nitrogen transformations, respiration, soil structure and porosity formation, etc. Overviews of herbicide effects on soil organisms are provided by Eijasackers and van de Bund (1980), Greaves and Malkoney (1980), Greaves and others (1976), and Martin (1963). Although stimulatory as well as inhibitory responses have been observed in micro-organisms, much remains to be learned about the complex interactions between soil organisms and herbicides. Effects are very much dependent on the herbicide, application rate, and soil environment factors. Where adverse effects have been observed, herbicide concentrations exceeded those measured under actual operational conditions (Fletcher and Friedman 1986). There is, however, a general consensus that herbicide usage at normal forestry rates does not reduce the activity of micro-organisms.

CONCLUSIONS: There is no evidence that the herbicides proposed in this EIS produce any adverse effects on site and soil productivity.

WATER QUALITY

The occurrence and significance of herbicide residues in surface waters result from a complex set of factors. Occurrence depends on the type and location of surface water, mixing and dilution of streamflow, herbicide properties such as solubility and degradation potential, method and timing of application, timing and amount of rainfall, site characteristics, and soil properties. The biological significance of a residue concentration depends upon water usage, toxicity levels, and exposure. The legal significance depends upon water quality standards.

Occurrence

The concentrations of herbicides in surface waters depend largely on the type of water and location in relation to the application area. Streams generally have the most variable concentrations, and surface flow from first-order drainages contains the highest residue concentrations. Streams receiving herbicide residues in flow from ephemeral channels generally have concentrations one to two orders of magnitude higher than those receiving only subsurface flow. Wetlands close to treatment areas may contain higher residue levels because of their small size and lack of flushing. Herbicide concentrations in lakes depend on residue inputs, lake size, and recharge by ground water or streamflow.

Mixing and dilution are very important in determining amount and duration of herbicide residues in surface waters. Neary and others (1983) measured hexazinone concentrations that averaged 0.442 ppm (mg/L) in stormflow from 2.5 ac (1 ha) ephemeral watersheds, but were less than 0.002 ppm during the same storm downstream at a 250 ac (100 ha) watershed. This resulted in an actual dilution factor of 221 compared to a straight area ratio of 100. Within large watersheds (50,000 ac or about 20,000 ha) entirely under intensive silviculture, dilution factors for forestry herbicide residues could range from 30 to 45,000 times. The former value is a straight area ratio based on herbicide treatment of each unit area of land once in a 30 year rotation. The latter value is based on only one unit area (1 ha or 2.5 ac) of the large watershed being treated with one particular herbicide and application of the field-measured dilution factor (221).

In a local study, Watson and others (1989) were unable to detect any picloram in a 4,225 acre (17 km^2) watershed during the first 90 days after treating miles (4 km) of a streamside road on granitic soils with 1 lb/ac (1.12 kg/ha) picloram. Loss by photodegradation during the first 7 days was considered important; 78% of the picloram persisted on site after 90 days.

Herbicide properties such as use rate, solubility, adsorption coefficient, and half-life are very significant in determining the amounts of residues which enter into surface waters. Herbicides with a typical use rate of greater than 4.0 kg/ha (greater than 3.6 lb/ac) are more likely to be detected in surface flow than those used at less than 0.40 kg/ha (less than 0.36 lb/ac). Solubility is a general index of potential to move in water, but there are exceptions. Positively charged glyphosate is highly soluble in water but generally does not move off-site to any appreciable extent since it is quickly adsorbed to organic matter in the soil and immobilized. Negatively charged picloram is highly soluble and easily mobile. Although picloram can be adsorbed to the soil it is readily desorbed and mobilized. Herbicides subject to photodegradation are also less likely to be found in surface water.

The method and timing of applications is extremely important. The type of equipment used and the timing in relation to climatic and vegetation variables are also critical.

Rainfall timing, amount, and intensity affect herbicide concentrations in streamflow. These effects are very much a result of the type of hydrologic response (surface runoff versus subsurface flow). Very large storms (greater than 25 year return period) generally do not result in high herbicide concentrations because of dilution by large flow volumes. Likewise, small storms (less than 1 month return period) may not produce sufficient stormflow. It is the intermediate storms that produce the higher concentrations.

Site characteristics like topography, treatment-area size in relation to watershed area, and distance to nearest perennial stream are other factors affecting occurrence of herbicide residues in surface waters. Soil characteristics are also important. Organic matter is the most important factor. Soils high in organic matter have a large potential to retain herbicide residues in an adsorbed condition while soils low in organic matter like sands have a low capacity to hold herbicide residues within the soil profile.

Significance

If herbicide residues enter surface or ground water, their significance is determined by residue duration, water usage, chemical toxicity, and potential exposure of humans, animals, or plants. For many herbicides there are no water quality standards because of their low toxicity, the infrequency of their occurrence in drinking water supplies, and the recent nature of their use in forests. Herbicides such as 2,4-D (0.100 ppm) and picloram (1.050 ppm) have established drinking water quality standards (NRC 1983).

One important issue to consider is the distinction between contamination and pollution. All water is contaminated. That is, no surface or ground water is pure. All water contains varying levels of other elements or compounds. On the other hand, water is normally considered polluted only when concentrations of contaminants exceed a water quality standard and threaten some use of the water. In the case of herbicide residues in water, the scientific contamination/pollution distinction often conflicts with individual perceptions of risk. As analytical instrumentation and techniques improve, herbicide residues are being measured at lower concentrations. Detection of herbicide residues, other compounds, or elements does not imply that pollution has occurred or that a health risk exists. Thus, objective evaluations of the significance of short-duration, low-level concentrations of herbicides in water must be made.

Herbicide Residues in Surface Waters

The remainder of this section will discuss the occurrence of herbicide residues in surface water. References from other forest ecosystems will be used to augment these data where information on particular chemicals is lacking.

2,4-D: This is one of the phenoxy herbicides that functions as a plant growth regulator. Since its introduction into forestry in the late 1940's, it has become the most widely used and intensively studied forestry herbicide still in use (Norris 1981a). A large variety of formulations are available commercially (Sassman and others 1984). Salt formulations are readily absorbed through the roots of weeds, and ester formulations are most easily absorbed through the foliage.

Toxicological studies indicate that most formulations are mildly toxic to mammals and birds. 2,4-D does not bioaccumulate to any appreciable extent. It is highly soluble in water and is translocated and metabolized readily within plants. Persistence of 2,4-D in forest soils is rather short (less than 4 weeks) as it is degraded by microbes, translocated into plants, and photodegraded to a limited extent (Norris 1981b). Volatilization is dependent on formulation. Transport losses from soils to water are mediated by organic matter, low surface runoff in most forest soils, and moderately rapid microbiological degradation.

A review of 2,4-D residues in water after forestry applications in the Pacific Northwest indicated that 90 percent of the streamflow samples contained no 2,4-D and the remainder had an average concentration of less than 0.040 ppm (Sassman and others 1984). 2,4-D was applied to all but a narrow (less than 5 m) buffer strip of Watershed 6 (9 ha or 22 ac) at the Coweeta Hydrologic Laboratory in western North Carolina (Douglass and others 1969). Application of 3.4 kg/ha (3.0 lb/ac) in 760 L of water carrier by a ground spray system did not result in any detectable 2,4-D in the stream.

GLYPHOSATE: This is a broad spectrum herbicide that is very effective on a number of forest weed species. The isopropylamine salt formulation is soluble in water, but glyphosate is strongly adsorbed in the soil. This herbicide is readily absorbed and translocated within plants but is not metabolized. The major degradation pathway is microbial breakdown. Glyphosate does not photodecompose to any extent and does not volatilize (Rueppel and others 1977). It is low in toxicity to aquatic and terrestrial organisms.

Glyphosate residues up to 5.2 ppm have been measured in runoff from agricultural fields with high transport of sediment. Residues in canals from weed control with glyphosate on ditchbanks were considerably lower

(0.010 ppm) (Sacher 1978). Aerial application of glyphosate to a forested watershed resulted in low initial concentrations in streamflow (0.070 ppm). No buffer strips between the perennial stream and the herbicide-treated area were used. A peak concentration of 0.550 ppm occurred 14 days after application with a rapid decline in concentrations because of micro-organism degradation (Newton and others 1984).

PICLORAM: This herbicide belongs to the picolinic acid family of chemicals and functions similarly to the phenoxyacetic acid herbicides in mimicking growth hormones. It is very effective on many resistant woody weeds (NRCC 1974).

Picloram and its salts are relatively nontoxic to most non-target organisms including micro-organisms, fish, and birds. Since picloram is formulated as a potassium or isopropanolamine salt, it has a high water solubility. That combined with a relatively low adsorption coefficient makes water contamination a concern with the use of picloram. This is particularly the case since many vegetable crops are sensitive to picloram at concentrations as low as 0.010 ppm (Baur and others 1972).

Losses of picloram due to volatilization are low and photodegradation occurs only in direct sunlight. Picloram is only slowly degraded by micro-organisms which is why it has a longer half-life. The half-life of picloram is climate and soil dependent and can be as short as 30 days in humid-warm climates and as long as 180 days in cold-dry ones (NRCC 1974).

Picloram concentrations in streamflow have been studied extensively in a number of ecosystems (NRCC 1974; Watson and others 1989). Applications to rangelands in Texas have produced peak concentrations of up to 2.170 ppm. Usually this involves surface runoff shortly after application with no buffer strip.

Picloram was manually broadcast at a rate of 5.0 kg/ha (4.5 lb/ac) to 17% of a 30 ha (74 ac) watershed in the Appalachian Mountains (Neary and others 1985). Residues of the herbicide were measured in soil solution on the treatment site at concentrations up to 0.350 ppm. A 100 m (328 ft) buffer strip between the application area and a first-order perennial stream reduced picloram concentrations down to sporadic peaks of less than 0.010 ppm during 17 months of monitoring.

In a local study, Watson and others (1989) were unable to detect any picloram in a 4,225 acre (17 km^2) watershed during the first 90 days after treating miles (4 km) of a streamside road on granitic soils with 1 lb/ac (1.12 kg/ha) picloram. Loss by photodegradation during the first 7 days was considered important; 78% of the picloram persisted on site after 90 days.

Herbicide Residues in Ground Water

Contamination of ground water has become a national priority environmental issue in the past few years because of growing incidents of herbicide residues being detected in wells. It is important to address the issue of potential ground water pollution from operational use of forestry herbicides.

Regional, confined ground water aquifers are not likely to be affected by forestry herbicides (Neary 1985a). Unconfined surface aquifers in the immediate vicinity of herbicide application zones have the highest risk of contamination. These aquifers are directly exposed to leaching of residues from the root zone. Discussion will focus on these surface aquifers.

SOURCES: In the operational use of herbicides there are two types of sources of herbicide contaminants in ground water. These are point sources which occur as a result of spills in the transportation, storage, mixing, and loading phases of herbicide use. Point source pollution is a hazard with the use of any chemical not just forestry herbicides, and accounts for some of the worst cases of localized ground water pollution. During and

after the application of herbicides in forest ecosystems, movement of residues into ground water could occur on a landscape scale. This type of pollution is non-point in nature and will be the focus of this discussion.

The data base on ground water contamination from forestry herbicide use is very limited. Few studies have focused on the non-point source aspect of forestry herbicide fate and transport. Also, because of the infrequent use, and low application rate of forestry herbicides, few aquifer contamination problems have arisen from operational application of forestry herbicides. Some information for typical operational conditions is available for picloram and 2,4-D. These data are from unconfined surface aquifers within 1 to 6 m (3 to 20 ft) of the soil surface.

PICLORAM: Use of this herbicide at low rates (less than 1.0 kg/ha) with 2,4-D for injection has not produced any significant ground water contamination. Monitoring of a number of watersheds in Georgia, Tennessee, and Alabama did not detect picloram residues in baseflow originating from shallow ground water. Application of 5.0 kg/ha (4.5 lb/ac) of picloram as a pelleted formulation for site preparation was monitored in the Appalachian Mountains (Neary and others 1985). Picloram residues were detected in baseflow which fed a spring system of a first-order watershed for only 18 days and were less than 0.001 ppm. Infrequent and short duration pulses of picloram (less than 0.010 ppm) occurred over a 17-month period in a 10 ha (25 ac) first-order perennial stream. Peak concentrations were 1 percent of the suggested drinking water standard, but close to levels which might affect sensitive agricultural crops. In-channel dilutions between the treated watershed and any potential irrigation intakes were of such a large magnitude to preclude deterioration in irrigation water quality.

2,4-D: This herbicide was hand-sprayed on 9 ha (22 ac) of Watershed 6 at the Coweeta Hydrologic Laboratory in Western North Carolina at a rate of 3.4 kg/ha (3.0 lb/ac) (Douglass and others 1969). 2,4-D was never detected in baseflow originating from near-surface groundwater perched over consolidated bedrock. In a recent study on the Chattahoochee National Forest of northern Georgia (Michael 1985), 2,4-D was applied by injection to 50 percent of a 3.3 ha (8.0 ac) watershed at a rate of 2.2 kg/ha (2.0 lb/ac). Springflow arising from near-surface groundwater was sampled continuously for 165 days after herbicide application. 2,4-D was not detected in any of the samples collected. A sample collected 300 days after application did not contain 2,4-D.

GLYPHOSATE: Ground water data are not available for forestry applications of glyphosate. The topic of ground water contamination by pesticides has become a national priority research issue. Most problems have resulted from repeated applications of agricultural pesticides. Based on the limited forestry data, which include a very soluble chemical applied at a high rate (picloram), normal use of glyphosate should not pose a ground water contamination problem much less a pollution one.

SOIL AND WATER SUMMARY AND CONCLUSIONS

This section has examined the patterns and types of herbicides considered in the Lolo National Forest Noxious Weed Management EIS. These forest ecosystems often overlie major ground water recharge zones and contain streams often used for domestic water supplies. We have discussed the limited herbicide fate and movement data from typical forestry uses to indicate some of the potential impacts on water quality. The following conclusions can be made regarding the impacts of these herbicides on the quality of surface waters and ground water:

1. Current herbicide application technology exists to minimize herbicide residue movement into sensitive surface waters. Short-duration residue concentrations of 0.5 to 1.0 ppm might occur during stormflow. On-site degradation processes and in-stream dilution and degradation result in quick dissipation of herbicide residues. Short-term water quality effects are minimal, and long-term water quality is not adversely affected. Long-term water quality can be improved by herbicide use since stream sedimentation is reduced.

2. There is no documentation or indication of adverse biological effects on soil productivity from use of the silvicultural chemicals examined in this environmental impact statement.

3. At currently registered herbicide application rates, some short duration, low level (less than 0.024 ppm) pulses of herbicide residues could enter unconfined surface aquifers. Detectable residues would not persist for a long time and would not be likely to exceed water quality standards. Contamination of regional ground water aquifers is not likely.

4. The greatest hazards to surface and ground water quality arise from a possible accident or mishandling of concentrates during transportation, storage, mixing and loading, equipment cleaning, and container disposal phases of the herbicide use cycle.

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WILDLIFE HERBICIDE TOXICITY

This section summarizes the toxicity of the herbicides proposed for use in the Lolo National Forest Noxious Weed Management EIS. It is an edited version of Section 6, Appendix A, Vegetation Management in the Coastal Plain/Piedmont DEIS (USDA 1988). Summarized here are the findings of laboratory and field studies that indicate the toxicity to wildlife of the herbicides and additives proposed for use on noxious weeds. In many cases, laboratory studies of domestic animals have been used because of a lack of studies specifically on wildlife. The results of domestic animal studies are considered to be representative of the effects that would occur in similar species in the wild.

Differences in sensitivity to toxic substances that occur between species are primarily accounted for by differences in metabolism (Calabrese 1983). Other important factors that also account for these differences in sensitivity are absorption, plasma protein binding, biliary excretion, and intestinal microflora (Calabrese 1983).

Rodent toxicity studies, as well as carcinogenicity and mutagenicity results, elsewhere (USDA 1988: Appendix A, Section 3; and Monnig 1988). They will not be repeated in detail here. The relative toxicity of the chemicals, based on the range of LD_{50} values, was based on the same toxicity categories used by EPA for humans. The toxicity rating used in this risk assessment for honey bees is that of Dr. Larry Atkins (University of California). It is based on the amount of herbicide required to kill a bee: less than 2 micrograms (μg)/bee is classified as highly toxic, 2 to 11 μg/bee is moderately toxic, and greater than 11 μg/bee is relatively nontoxic (Al Vaughan, Ecological Effects Branch, Hazard Evaluation Division, EPA, personal communication 1987).

The acute toxicity of the three herbicides considered to rats and mallards is summarized in Table H-2.

Table H-2: Acute toxicity of picloram, 2,4-D and glyphosate to rats and ducks

	Oral LD_{50} (mg/kg)	
Herbicide	Rat	Mallard
Picloram	8,200	2,000
2,4-D		
Acid	375	2,000
Butyl ester	620	2,025
Glyphosate	4,320	2,000[1]

[1]Bobwhite; no value for the mallard is available.

Picloram

Picloram is slightly toxic to mammals, based on acute oral LD_{50}'s ranging from greater than 540 mg/kg in calves to 8,200 mg/kg in rats (Table H-3) (Lynn 1965; Jackson 1965). Technical picloram caused mild eye and skin irritation in rabbits (EPA 1984b). Picloram was not teratogenic in rats at the highest dose tested of 1,000 mg/kg (EPA 1984b). In a study by John-Greene and others (1985), picloram was not teratogenic in rabbits at 400 mg/kg

(highest dose tested). The Tordon 101® formulation caused no ill effects in sheep at single doses of 1,900 mg/kg, but it caused death at levels of 2,200 mg/kg and above (Lynn 1965). Temporary weight loss was the only adverse effect seen in calves given Tordon 101® in single doses of 1,900 to 3,163 mg/kg (Lynn 1965). No toxic signs or adverse effects on growth were observed in sheep given 18 mg/kg/day of technical picloram in the diet for 33 days (Jackson 1965). Stimulated growth and improved feed efficiency were observed in swine given 22 mg/kg of feed for an unspecified time (McCollister and Leng 1969). Metabolic and residue studies in mammalian species indicate that picloram is rapidly eliminated unchanged in the urine following ingestion (Sassman and others 1984). No metabolites have been detected (Sassman and others 1984). In addition, picloram does not appear to accumulate to any significant extent in animal tissues (Sassman and others 1984).

Picloram is slightly toxic to birds based on LD_{50}'s that range from greater than 2,000 mg/kg in mallards and pheasants to approximately 6,000 mg/kg in chickens (Table H-3) (Lynn 1965; Hudson and others 1984). Regurgitation occurred shortly after mallards were treated, and pheasants exhibited tremors and mild decline of muscle coordination after treatment (Hudson and others 1984). Subacute dietary LC_{50}'s for bobwhite and Japanese quail, ring-necked pheasants, and mallard ducks were all greater than 5,000 ppm (HSDB 1987). The 8-day dietary LC_{50} of the Tordon 101® formulation is greater than 10,000 ppm for bobwhite quail and mallard ducks (EPA 1984b).

Japanese quail given 100 ppm in a 2-week dietary study showed no effects on feathering, reproduction, mortality, and weight (Kenaga 1969). In a similar test at 1,000 ppm, egg fertility and hatchability were reduced the first week but not the second (Kenaga 1969). A three-generation study with Japanese quail showed no effects on food consumption, reproduction, survival, and body weight when given 100, 500, or 1,000 ppm in the diet (Kenaga 1969). In a 1-year study in which Japanese quail were given 100 ppm to 10,000 ppm in their diet, no effects on reproduction, feeding, or body weights were observed. Mortality rates of treated quail were lower than those of controls (Kenaga 1969).

The LC_{50} of mallard eggs immersed in an aqueous emulsion of picloram was equivalent to a field application rate of 112 kg/ha (100 lb/acre), which is more than 10 times the recommended field application level (Hoffman and Albers 1984). Spray treatment of fertile chicken eggs or ring-necked pheasant eggs with a dose equivalent to 2.8 kg/ha (2.5 lb/acre) of Tordon 101® did not affect embryonic development or subsequent growth of hatched chicks (EPA 1984b).

Picloram is relatively nontoxic to insects based on an acute contact LD_{50} of greater than 14 μg/bee in honey bees (Kenaga 1979). Honey bees given 1,000 ppm picloram in a 60-percent sucrose syrup showed no toxic effects after 14 days and no increase in mortality compared to the control group after 60 days (Sassman and others 1984).

Table H-3: Acute oral toxicity of picloram to mammals and birds

Species	LD_{50} (mg/kg)
Rat	8,200[1]
Mouse	2,000 to 4,000[1]
Rabbit	approx. 2,000[1]
Guinea pig	approx. 3,000[1]
Sheep	720[2]

Table H-3: Acute oral toxicity of picloram to mammals and birds (continued)

Species	LD_{50} (mg/kg)
Calf	540[2]
Chicken	approx. 6,000[1]
Mallard duck	2,000[3]
Pheasant	2,000[3]

[1]Source is Hudson and others 1984.
[2]Source is Jackson 1965.
[3]Source is Lynn 1965.

2,4-D

2,4-D is moderately toxic to vertebrate species (Table H-4). There are significant differences in toxicity to vertebrates among the forms of 2,4-D (amines, butyl esters, iso-octyl esters, and propylene glycol butyl ether esters) (Ghassemi and others 1981). In many instances, toxic response to a specific 2,4-D formulation appears to be species-specific (Sassman and others 1984).

Oral LD_{50}'s in mammals range from 100 mg/kg for dogs, cattle, and swine to 848 mg/kg for guinea pigs (Sassman and others 1984; Ghassemi and others 1981). Toxic effects include gastrointestinal disturbances, weight loss, muscle weakness, and loss of coordination (Sassman and others 1984). Mild to moderate eye, skin, and respiratory irritation is caused by some formulations (Sassman and others 1984). No teratogenic or reproductive effects have been observed in rats (EPA 1986a).

Table H-4: Acute oral toxicity of 2,4-D to mammals and birds

Species	Form of 2,4-D	LD_{50} (mg/kg)
Rat	Acid Butyl ester	375[1] 620[1]
Mouse	Acid Butyl ester	368[1] 380[1]
Guinea pig	Acid Butyl ester	469[1] 848[1]
Rabbit	Acid Butyl ester	800[1] 424[1]
Dog	Acid	100[1]

Table H-4: Acute oral toxicity of 2,4-D to mammals and birds (continued)

Species	Form of 2,4-D	LD_{50} (mg/kg)
Cat	Butyl ester	820[1]
Cattle	Butyl ester	100[1]
Mule deer (8-11 months)	Acid	400 to 800[2]
Chicken	Acid Butyl ester	541[1] 2,000[1]
Mallard (3-5 months) (4 months)	Acid Amine (4 lb a.e./gal)	2,000[2] 2,025[2]
Pheasant (3-4 months)	Acid	472[2]
Pigeon	Acid	668[1]
Japanese quail (2 months)	Acid	668[2]
Chukar (4 months)	Acid	200 to 400[2]

[1]Source is Sassman and others 1984.
[2]Source is Hudson and others 1984.

In birds, acute oral LD_{50}'s for 2,4-D range from 472 mg/kg in pheasants (3 to 4 months old) to more than 2,000 mg/kg in mallards (4 months old) (Hudson and others 1984). Toxic effects include excessive thirst and salivation, tremors, exhaustion, and imbalance (Hudson and others 1984). Eight-day dietary studies with the dimethylamine salt of 2,4-D and the butoxyethanol ester of 2,4-D yielded LC_{50} values of more than 5,000 ppm for Japanese quail, bobwhite quail, ring-necked pheasants, and mallard ducks (Hill and others 1975, as cited in Sassman and others 1984). No reproductive or teratogenic effects were observed in the eggs of chickens and pheasants when sprayed with various forms of 2,4-D, even at dosage levels of up to 20 times the recommended field application rate (Sassman and others 1984). Chicken eggs injected with 2,4-D to give concentrations of 10, 50, 100, 200, and 300 ppm in the eggs resulted in hatching success rates of 83, 100, 71, 62 and 0 percent, respectively, of the control hatch (Dunachie and Fletcher 1970, as cited in Sassman and others 1984). The LC_{50} of mallard eggs immersed in an aqueous emulsion of 2,4-D was a concentration equivalent to a field application rate of 215 kg/ha (192 lb/ac), which is 128 times the regional average field application rate of 1.68 kg/ha (1.5 lb/ac) (Hoffman and Albers 1984).

The bioaccumulation ratio is low for tested animals exposed to 2,4-D, and accumulated residues are rapidly excreted once exposure ceases (Norris 1981, as cited in Sassman and others 1984). Very few monitoring data exist on 2,4-D levels found in wildlife. However, studies by Erne (1974) in Sweden found levels of 2,4-D residues that ranged from 0.05 to 6 mg/kg in liver and kidney tissue of 250 samples of wildlife (including moose, roedeer, reindeer, red deer, fallow deer, hares, pheasants, grouse, and other species) taken by hunters or found dead during the period 1968 to 1972.

There is some indication in the literature that after treatment with 2,4-D, there is increased palatability (and possibly increased toxicity) of normally unpalatable weeds (Irvine and others 1977). This was observed in ragwort (*Senecio jacobaea*, Britain's most serious poisonous weed to domestic livestock) after 2,4-D application (Irvine and others 1977). Increased palatability was thought to be related to an increased water-soluble

carbohydrate content. The authors reported that 2,4-D also may have increased the total unsaturated pyrrolizidine alkaloid content, thus increasing the plant's toxicity. Based on the results of this study, it was suggested that cattle be withheld from pastures for about 3 weeks after application of 2,4-D. Effects on grazing wildlife have not been reported.

Based on studies with honey bees, insects appear to be relatively tolerant to high levels of 2,4-D (Sassman and others 1984). The LD_{50} of 2,4-D for honey bees ranged from 11.525 μg/bee for an unspecified route of exposure to 105 μg/bee administered orally (Sassman and others 1984). Bees fed purified 2,4-D had decreased lifespans (approximately half the lifespan of bees exposed to lower doses) at 1,000 ppm; however, lifespans were not shortened in bees fed up to 1,000 ppm of the butoxyethanol ester, isooctyl ester, or the dimethylamine salt of 2,4-D (Sassman and others 1984). A temporary decrease in reproductive rate was observed in bees fed 100 ppm or more of an unspecified 2,4-D formulation (presumed to be an acid), although no effects were observed at 10 ppm. The effect was reversible and abated when exposure was stopped (Sassman and others 1984).

Glyphosate

Glyphosate is generally recognized to be of low toxicity in the environment (Sassman and others 1984). Acute oral LD_{50}'s are 4,320 mg/kg for the rat and 3,800 mg/kg for the rabbit (EPA 1984b; Sassman and others 1984). Based on these values, glyphosate can be considered slightly toxic.

Oral LD_{50} values for the Roundup© and Rodeo© formulations in rats are 5,400 mg/kg and greater than 5,000 mg/kg, respectively (Monsanto 1983; 1985). The oral LD_{50} of Roundup© for goats is 4,860 mg/kg (Monsanto 1985). Glyphosate, Roundup©, and Rodeo© are reported to be practically nonirritating or slightly irritating to the eyes and skin of rabbits (Monsanto 1983; 1985). Based on a 26-month feeding study, a NOEL of greater than 31 mg/kg/day was established for rats (EPA 1986b). In a 1-year oral study with dogs, a NOEL of 500 mg/kg/day (highest dose tested) was determined (EPA 1987). Glyphosate has caused no reproductive or teratogenic effects in rats or rabbits (EPA 1984b).

Studies conducted on black-tailed deer in pens in the Pacific Northwest showed no gross adverse health effects caused by the use of glyphosate for vegetation management (Sullivan 1985). Glyphosate-treated browse and commercial chow were as acceptable for consumption by deer as untreated food. Likewise, glyphosate-induced weed and shrub control did not adversely affect deer use of treated habitat areas for at least the first year after treatment.

In a study to evaluate the direct effects of glyphosate on small mammals, no adverse effects on reproduction, growth, or survival were observed in populations of deer mice during the year following treatment (Sullivan 1985).

Glyphosate is slightly toxic to birds based on the acute oral LD_{50} of greater than 2,000 mg/kg in bobwhite quail (EPA 1986c). The 8-day dietary LC_{50} is more than 4,000 ppm for both mallard ducks and bobwhite quail (EPA 1986c). Avian reproduction studies yielded no reproductive effects at dietary exposure levels of up to 1,000 ppm (EPA 1986c).

Residue and metabolism studies have indicated that glyphosate is incompletely absorbed across the gastrointestinal membranes and that in the vertebrates tested, there is minimal metabolism or retention by tissues and rapid elimination of residues (Monsanto 1982).

Glyphosate is relatively nontoxic to insects based on the 48-hour acute toxicity of greater than 100 μg/bee in honey bees (EPA 1986c).

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LOLO BIG GAME WINTER RANGE FORAGE PRODUCTIVITY LOSS CALCULATIONS

Estimating losses in elk forage due to invasion of knapweed and leafy spurge on all susceptible sites involves the following mathematical steps. Assumptions are discussed in Chapter IV of the EIS (pages IV-16 through IV-19).

Total elk on the Forest: 12,500

Total winter range: 350,000 acres

acres susceptible to total conversion to knapweed: 48,000

percent of total winter range: 14% (48,000/350,000)

current forage productivity: 1,049 lbs/ac

worst-case forage productivity after total weed invasion: 124 lbs/ac

potential productivity loss on susceptible sites after 50 years: 88% [(1,049 - 124) ÷ 1,049] x 100%

net forest-wide loss in productivity on susceptible sites after 50 years: 12% (14% x 88%)

current forest-wide productivity loss on susceptible sites (assuming 25% of susceptible winter range is now infested with weeds): 3% (25% x 12%)

acres at low risk to weed invasion or conversion: 302,000

percent of total winter range: 86% (302,000 ÷ 350,000)

total shrub forage productivity: 150 lbs/ac

percent loss in shrub productivity due to weeds: 0%

time period that shrubs make up diet: 67% (4 months ÷ 6 months)

total grass forage productivity: 127 lbs/ac

reduction in grass production due to weeds: 25%

time period that grasses make up diet: 33% (2 months ÷ 6 months)

potential productivity loss on low risk sites after 50 years: 8% [(67% x 0%) + (33% x 25%)] x 100%

net forest-wide loss in productivity on low risk sites after 50 years: 7% (86% x 8%)

current forest-wide productivity loss on low risk sites (assuming 25% of susceptible winter range is now infested with weeds): 2% (25% x 7%)

Net loss in winter range productivity for all winter range sites

Current level of infestation	
loss on high risk sites:	3%
loss on low risk sites:	2%
total loss in productivity:	5%
Potential 50-year loss assuming no biological control	
loss on high risk sites:	12%
loss on low risk sites:	8%
total loss in productivity:	20%

Net benefit from knapweed consumption

use period: December-March or 50% of the winter range use period

percent of diet during this period: maximum of 5%

increase in productivity

high risk winter ranges: 0.7% (14% x 100% x 5%)

low risk winter ranges: 1.1% (86% x 25% x 5%)

net increase due to kapweed consumption: 2% (0.7% + 1.1 % = 1.8% ≈ 2%)

Adjusted losses in productivity based on knapweed forage benefit

Current loss in productivity: 3% (5% -2%)

Potential 50-year loss: 18% (20% - 2%)

BIOLOGICAL EVALUATION
Lolo Noxious Weed Environmental Impact Statement
Prepared by Mike Hillis

Noxious weeds present a significant threat to various resources on the Lolo National Forest. Treatment alternatives, including the use of herbicides, are considered in the Lolo Weed EIS. The impacts of these alternatives were assessed upon threatened, endangered, and sensitive species.

Threatened and endangered species on the Lolo include the grizzly bear, gray wolf, peregrine falcon, and bald eagle. Sensitive species include the common loon, Coeur d' Alene salamander, harlequin duck, western big-eared bat, and boreal owl.

It's assumed that mechanical treatment of weeds (mowing, pulling, etc.) on a small scale (less than 1% of the Forest) will have no effect on threatened, endangered, or sensitive species. Indiscriminate use of pesticides, however, could have negative effects on wildlife. This Biological Evaluation is limited to the effects of herbicides on threatened, endangered, and sensitive species.

Description of the alternatives: The alternatives range from no herbicide treatment to approximately 12,600 acres of herbicide treatment per year (approximately 0.5% of the Forest). Application will be done by hand or boom truck. No aerial application is anticipated. Chemicals will be limited to picloram, 2,4-D, and glyphosate. Application rates will be well below maximum rates prescribed on product labels. Mitigative measures that will be applied to all alternatives where herbicides are considered include:

1. Within riparian communities, treatment will be limited to hand/wick application of glyphosate (considered the safest of all herbicides);

2. Picloram will not be used on sandy, porous soils where groundwater is within 10 feet of the surface; nor within riparian ecosystems, ditches, or streambanks.

Potential effects on threatened, endangered, or sensitive species:

	Conceivable Adverse Effects
grizzly bear	direct poisoning from consuming treated grass indirect poisoning from consuming contaminated carrion
gray wolf	indirect poisoning from consuming contaminated mammals/birds
peregrine falcon	indirect poisoning from consuming contaminated birds
bald eagle	indirect poisoning from consuming contaminated fish, carrion or birds
common loon	indirect poisoning from consuming contaminated fish
Coeur d' Alene salamander	no perceivable effects since treatment is geographically isolated from suitable habitat
harlequin duck	no perceivable effects since restrictions on herbicide use in riparian areas should prevent effects on aquatic insects eaten by the duck

Conceivable Adverse Effects (continued)

western big-eared bat	no perceivable effects since these herbicides have little effect on insects eaten by the bat
boreal owl	no perceivable effects since treatment is geographically isolated from suitable habitat

***Determination of Effect*:** For most species, the biggest threat from herbicides is indirect poisoning, such as would occur with an eagle feeding on a contaminated winter-killed elk. The grizzly bear also faces some threat from feeding directly on treated grass. Dosage rates, expressed as a percent of the LD_{50} (dose at which 50% of a population of test animals is killed by the chemical), were calculated (See attached document) for a number of animals including both herbivores and carnivores, and mammals and birds. At prescribed application rates for the three chemicals being considered, all calculated dosage rates were very low and should constitute no risk to the animal. This included canids which are considered most sensitive to 2,4-D. These dosage rates were calculated for both direct and indirect consumption.

During informal consultation with Carol Taylor of the U.S. Fish and Wildlife Service, it was determined that while dosage rates indicated virtually no risk to T&E species, some additional constraints were needed to insure "no effect" on those species. These additional constraints include:

1. no herbicide use within occupied grizzly bear habitat, unless project analysis indicates no risk[1] via direct or indirect consumption;

2. no herbicide use within 1 to 2 miles of historic or suitable peregrine eyries, or proposed hack sites (specific distances will be determined at the project level) unless project-level analysis indicates no risk[1] via indirect consumption;

3. no herbicide use within ½ mile of rivers within essential bald eagle habitat unless project analysis indicates no risk[1] for indirect effects.

[1] An example of a "no risk" project-level analysis might include the use of 2,4-D (a short-lived chemical) on nonriparian soils within essential bald eagle habitat if it was determined that no eagles were nesting in the vicinity. Since 2,4-D breaks down within 1 to 2 weeks there could be no impact on eagles nesting in successive years. The same strategy could be applied to unoccupied peregrine habitat. Long-lived chemicals (such as picloram) would be prohibited in such situations due to possible impacts on birds potentially using the area in successive years.

***Statement of Effect*:** Considering: 1) the Forest-wide mitigative measures required; 2) special mitigative measures required in T&E habitats; 3) the low dosage rates anticipated, and 4) that treatment will be confined to no more than approximately 0.5% of the Forest per year, **there will be no adverse impact on threatened, endangered, or sensitive species on the Lolo National Forest.**

The Coeur d' Alene salamander and boreal owl occur in habitats (waterfalls, and high elevation spruce/fir zones respectively) where noxious weeds aren't a problem. No spraying will occur in their habitats. Consequently, the program will have no adverse impact on these species.

AQUATIC ORGANISM HERBICIDE TOXICITY

The toxicity to aquatic species of the herbicides and additives proposed for use in the Lolo Noxious Weed EIS is summarized in this section. Information is presented on the acute and chronic toxicities of the herbicides to fish, aquatic invertebrates, and amphibians. This information is an abridged version of Section 6, Appendix A, DEIS for Vegetation Management in the Coastal Plain/Piedmont (USDA 1988).

The relative acute toxicities of the herbicides are classified according to a scheme by EPA (1985) where LC_{50} values are described as follows: 0.1 ppm (1 ppm = 1 mg/l), very highly toxic; 0.1 ppm to 1 ppm, highly toxic; 1 ppm to 10 ppm, moderately toxic; 10 ppm to 100 ppm, slightly toxic; and 100 ppm, practically nontoxic.

In some cases, a number of toxicity tests have been conducted under various water quality conditions with a particular herbicide and a given species that have resulted in a range of LC_{50} values (for example, technical grade picloram and rainbow trout in Mayer and Ellersieck 1986). In these cases, the lowest reported value from the range has been included in the tables below.

The terms listed below pertain to aquatic toxicology and are used frequently in this section:

LC_{50}	the concentration of a toxicant in water that is lethal to 50 percent of a population of test organisms within a specific period of time (usually reported for 96 hours).
EC_{50}	the concentration of a toxicant in water that has a specific effect on 50 percent of the test organisms. It is often used with animals where determining death is difficult, such as with *Daphnia* sp. In this case, immobilization of an animal is the measured endpoint.
MATC	maximum acceptable toxicant concentration, which is the hypothetical toxic threshold concentration of a toxicant in water bounded by the highest tested concentration that has no significant adverse effect and the lowest concentration having a significant effect.
Static test	toxicity tests (generally only acute tests) in which the solution in the test chamber is still (not flowing); the solution may be renewed during the course of the test.
Flow-through test	toxicity test (acute, subchronic, or chronic) in which the solution in the test chamber is flowing continuously or intermittently. Flow-through tests generally result in somewhat lower LC_{50}'s than static tests conducted under the same conditions.

Picloram

Tordon 101® (a mixture of picloram and 2,4-D) is slightly toxic, and picloram is generally moderately to slightly toxic to aquatic organisms. All reported LC_{50}'s for Tordon 101® are greater than 10 ppm (table H-5).

Aquatic insects and crustaceans have 24- to 96-hour LC_{50}'s of greater than 25 ppm for technical picloram. A 48-hour LC_{50} of 50.7 ppm has been reported for *Daphnia magna* exposed to technical picloram (Mayes and Dill 1984). *Daphnia* sp. showed no effect during a 24-hour exposure to 380 ppm of Tordon 101® (Sassman and others 1984). For lake trout and cutthroat trout, technical grade picloram (90 percent active ingredient) is more toxic than the other formulations, with 96-hour LC_{50}'s in these species of 4.3 and 4.8 ppm, respectively (Johnson and Finley 1980).

Woodward (1979) reported increased fry mortality in cutthroat trout at concentrations of picloram (technical grade) greater than 1.3 ppm and reduced fry growth above 0.61 ppm (flow-through tests). No adverse effects to cutthroat fry occurred below 0.29 ppm. The reported concentrations are initial peak concentrations, which are intended to simulate concentration resulting from runoff from a rainstorm. Mean concentrations for the exposure period were not reported. Similar findings have been reported by Scott and others (1977, as cited in Mullison 1985). Woodward (1976) has also reported chronic studies on lake trout, where 0.035 ppm of picloram adversely affected the rate of yolk sac absorption and growth of fry.

Mayes and others (1987) conducted chronic toxicity studies with embryo-larval rainbow trout exposed to technical picloram. They reported an MATC of between 0.55 ppm and 0.88 ppm and estimated as 0.70 ppm based on the geometric mean. Larval survival was significantly reduced at 2.02 ppm, and growth was significantly reduced at 0.88 ppm.

No adverse effects on growth were reported for algae, *Daphnia* sp., goldfish, and guppies exposed to 1ppm picloram for 10 weeks. Guppies exhibited no adverse effects at this same concentration after 6 months of exposure (Lynn 1965, as cited in Ghassemi and others 1981). Chronic studies with *Daphnia magna* by Gersich and others (1985) indicated an MATC of between 11.8 and 18.1 ppm with a geometric mean of 14.6 ppm. The MATC endpoint was based on mean total young/adult.

Studies with picloram (Tordon 50-D®) have reported 96-hour LC_{50}'s for 1-week-old tadpoles of 95 ppm for *Adelotus brevis* and 105 ppm for *Limnodynastes peroni* (Johnson 1976).

Table H-5: Toxicity of Tordon 101® (picloram/2,4-D formulation)[1] to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Rainbow trout	40.4	96-hour LC_{50}	Lynn 1965; Winston 1963, cited in Kenaga 1969.
Brook trout	64.6	96-hr LC_{50}	Lynn 1965; Winston 1963, cited in Kenaga 1969
Brown trout	61.9	96-hr LC_{50}	Lynn 1965; Winston 1963, cited in Kenaga 1969
Coho salmon	17.5	24-hr LC_{50}	Spehar and others 1981[1], cited in Sassman and others 1984
Green sunfish	40.4	96-hr LC_{50}	Kenaga 1969
Fathead minnow	17.4	96-hr LC_{50}	Lynn 1965; Winston 1963, cited in Kenaga 1969
Pugnose minnow	35.8	96-hr LC_{50}	Kenaga 1969
Goldfish	20.2	24-hr LC_{50}	Hardy 1963, cited in Kenaga 1969
Amphibia 1-week-old tadpoles *Adelotus brevis* *Limnodynastes peroni*	 95[2] 105[2]	 96-hr LC_{50} 96-hr LC_{50}	 Johnson 1976 Johnson 1976
Water flea (*Daphnia* sp.)	530	95% mortality at 24 hr; no mortality at 380 ppm	Lynn 1965

[1]10.2% picloram-triisopropylaniene salt, 5.7% a.e., and 21.2% a.e. 2,4-D triisopropylaniene salt).
[2]Tordon 50-D®.

Table H-6: Toxicity of picloram to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Snail	530	100% mortality at 72 hr; no mortality at 380 ppm	Lynn 1965
Rainbow trout	24-34	24 to 96 hr LC_{50}	USDI 1965, cited in Kenaga 1969
Coho salmon	21-29	96-hr LC_{50}	Bond and others, 1967, cited in Kenaga 1969
Bluegill	21-26.5	96-hr LC_{50}	Bond and others, 1967, cited in Kenaga 1969
Largemouth bass	13.1-19.7	24 to 48-hr LC_{50}	USDI 1964, cited in Kenaga 1969
Goldfish	14-36	24 to 96-hr LC_{50}	USDI 1964, cited in Kenaga 1969
Mosquito fish	120-133	24 to 96-hr LC_{50}	Johnson 1978, as cited in Sassman and others 1984
Brown shrimp	1	48-hr NOEL	USDI 1966, cited in Sassman and others 1984
Water flea (*Daphnia sp.*)	530 1	95% mortality at 24 hours; NOEL at 380 ppm No observed effect on growth and reproduction after 10 weeks	Lynn 1965 Hardy 1966, cited in USDA 1984
Eastern oyster	1	No observed effect on shell growth after 48 hours	Butler 1965

Table H-7: Toxicity of Technical Grade (90% a.i.) picloram to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Scud *(G. lacustris)*	48	48-hr LC_{50}	USDI 1968, cited in Sassman and others 1984
Rainbow trout	3.1 0.70	96-hr LC_{50}, toxicity greater in hard water MATC, reduced growth in embryo larvae	Mayer and Ellersieck 1986 Mayes and others, 1987
Lake trout	1.6 0.035	96-hr LC_{50}, toxicity greater in hard water Decreased rate of yolk sac absorption and growth in fry, chronic exposure	Mayer and Ellersieck 1986 Woodward 1976
Cutthroat trout	1.5 1.3 0.610 0.29	96-hr LC_{50} After 22 days exposure, increased fry mortality; Woodward 1979 reduced growth of fry; no adverse effects	Mayer and Ellersieck 1986 Woodward 1979 Woodward 1979
Bluegill	13.5	96-hr LC_{50}, toxicity greater in hard water	Mayer and Ellersieck 1986
Channel catfish	1.4	96-hr LC_{50}	Mayer and Ellersieck 1986

Table H-7: Toxicity of Technical Grade (90% a.i.) picloram to aquatic organisms (continued)

Species	Concentration (ppm)	Effect	Source
Water flea	50.7 68.3 14.6	48-hr LC_{50} 48-hr LC_{50} MATC based on mean total young per adult	Mayes and Dill 1984 Gersich and others 1985 Gersich and others 1985
Scud (*G. lacustris*)	27	96-hr LC_{50}	Sanders 1969
Stoneflies *Pteronarcella badia* *Pteronarcys californica*	 10.0 48	 96-hr LC_{50} 96-hr LC_{50}	 Mayer and Ellersieck 1986 Sanders and Cope 1968

2,4-D

The aquatic toxicity of the butoxyethanol ester of 2,4-D ranges from moderately to highly toxic (table H-9). Acute LC_{50} values range from about 0.5 ppm to 10 ppm for most species. Amphipods and snails are among the most sensitive groups. Esters are typically 100 times more toxic than their corresponding acids and most amine formulations, but, in most cases, they rapidly hydrolyze to corresponding acids (Ghassemi and others 1981).

Bioaccumulation of 2,4-D is low, and it generally is rapidly excreted in the urine unchanged or as a conjugate (Sassman and others 1984). 2,4-D amine is practically nontoxic to amphibians (Johnson 1976).

Table H-8: Toxicity of 2,4-D amine to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Rainbow trout	1.0 100	Avoidance behavior 96-hr LC_{50}	Folmar 1976, 1978, cited in Sassman and others 1984 Mayer and Ellersieck 1986
Chinook salmon	100	96-hr LC_{50}	Mayer and Ellersieck 1986
Green sunfish	25	No deaths after 8 days	Hiltibran 1967, cited in Sassman and others 1984
Bluegill	168 (123-230)[1] 40	96-hr LC_{50} No deaths at 12 days	Mayer and Ellersieck 1986 Hiltibran 1967, cited in Sassman and others 1984
Smallmouth bass fry	236 (185-300)[1] 25	96-hr LC_{50} No deaths at 8 days	Mayer and Ellersieck 1986 Hiltibran 1967, cited in Sassman and others 1984
Fathead minnow	335 (245-458)[1]	96-hr LC_{50}	Johnson and Finley 1980
Channel catfish	119 (109-130)[1]	96-hr LC_{50}	Mayer and Ellersieck 1986
Mosquitofish	405	96-hr LC_{50}	Johnson 1978, cited in Sassman and others 1984

Table H-8: Toxicity of 2,4-D amine to aquatic organisms (continued)

Species	Concentration (ppm)	Effect	Source
Lake chubsucker	25	No deaths at [illegible] days	Hiltibran 1967, cited in Sassman and others 1984
Long-nosed killifish	15	No effect at 48 hours	Butler 1965
Lymnodynastes peroni 1-week-old tadpoles	287	96-hr LC_{50}	Johnson 1976
Giant Toad 1-week-old tadpoles	288	96-hr LC_{50}	Johnson 1976
Crayfish	100	48-hr LC_{50}	Sanders 1970
Water flea	4.0 (3.4-4.9)[1]	48-hr EC_{50}	Mayer and Ellersieck 1986
Seed shrimp	8.0 (5.9-10.8)[1]	48-hr EC_{50}	Mayer and Ellersieck 1986
Scud *G. fasciatus*	100	96-hr LC_{50}	Mayer and Ellersieck 1986
Sowbug	100	48-hr LC_{50}	Sanders 1970, cited in Sassman and others 1984
Eastern oyster	2.0	No effect at 96 hrs	Butler 1965
Midge	100	48-hr EC_{50}	Mayer and Ellersieck, 1986
Amphibia (*Adelotus brevis*)			
1-week-old tadpoles	200	96-hr LC_{50}	Johnson 1976
4-week-old tadpoles	340	No deaths after 96-hours	

[1]Range is for the 95% confidence interval.

Table H-9: Toxicity of 2,4-D butoxyethanol ester to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Rainbow trout			
fingerlings	1.49	96-hr LC_{50}	Inglis and Davis 1972
yearlings	10.0	96-hr LC_{50}	Dodson and Mayfield 1979, cited in USDA 1986
Bluegill	1.2	96-hr LC_{50}	Mayer and Ellersieck 1986
Fathead minnow	3.3	96-hr LC_{50}	Mayer and Ellersieck 1986
Black bullhead	7.4	96-hr LC_{50}	Inglis and Davis 1972
Crayfish	100	48-hr LC_{50}	Sanders 1970
Glass shrimp	1.4	48-hr LC_{50}	Sanders 1970
Pink shrimp	1.0	48-hrs, no effect	

Table H-9: Toxicity of 2,4-D butoxyethanol ester to aquatic organisms (continued)

Species	Concentration (ppm)	Effect	Source
Water flea			
D. pulex	3.0	8 days, no effects	Sigmon 1979, cited in DEA 1986
D. magna	5.6	48-hr LC_{50}	Sanders 1970
Copepod	3.1	96-hr LC_{50}	Linden and others 1979
Scud			
G. lacustris	0.44	96-hr LC_{50}	Sanders 1969
G. fasciatus	5.9	96-hr LC_{50}	Sanders 1970
Sowbug	2.6	96-hr LC_{50}	Mayer and Ellersieck 1986
Seed shrimp	2.2	48-hr EC_{50}	Mayer and Ellersieck 1986
	1.8	48-hr LC_{50}	Sanders 1970
Stonefly (*Pteronarcys californica*)			
adult	1000	96-hr LC_{50}	FWPCA 1968, cited in DEA 1986
nymphs	1.6	96-hr LC_{50}	Sanders and Cope 1968
Eastern oyster	3.75	96-hr EC_{50}, decrease in shell growth	Butler 1965
Snail	0.32	at 6 wks 42% mortality	Lim 1978, cited in Halter 1980

Glyphosate

Glyphosate is available in various formulations, including Roundup® and Rodeo®. Because of its surfactant content, Roundup® is much more toxic to aquatic organisms than the Rodeo® formulation which does not contain surfactants. Therefore, the following data and discussion will focus on Rodeo® and technical glyphosate only.

Rodeo®. The Rodeo® formulation (53.5 percent isopropylamine salt of the active ingredient N-phosphonomethyl glycine and 46.5 percent water) of glyphosate is practically nontoxic to aquatic organisms (table H-10). The 96-hour LC_{50}'s for fish are all greater than 1,000 ppm, and the 48-hour LC_{50} for *Daphnia magna* is 930 ppm (Monsanto 1983).

Technical Glyphosate. Technical glyphosate is only slightly to practically nontoxic to fish and invertebrates (table H-11). Studies with channel catfish, bluegill, rainbow trout, and largemouth bass indicate that glyphosate does not bioaccumulate in fish to any significant degree (Monsanto, undated). The toxicity of glyphosate or glyphosate-formulations to amphibians has not been reported in the literature.

An MATC of greater than 25.7 ppm has been reported in a long-term study with fathead minnows (Monsanto, undated). A 21-day study with *Daphina magna* determined a NOEL of 50 ppm based on decreased reproduction (Monsanto, undated).

Table H-10: Toxicity of Rodeo® (glyphosate formulation) to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Trout	1,000 680-1,070[1]	96-hr LC_{50} 96-hr LC_{50}	Monsanto 1983 Mitchell and others (in press)
Chinook salmon	750-1,440[1]	96-hr LC_{50}	Mitchell and others (in press)
Coho salmon	600-1,000[1]	96-hr LC_{50}	Mitchell and others (in press)
Bluegill	1,000	96-hr LC_{50}	Monsanto 1983
Carp	10,000	96-hr LC_{50}	Monsanto 1983
Water flea (*D. magna*)	930	48-hr LC_{50}	Monsanto 1983

[1]Combined with X-77 surfactant.

Table H-11: Toxicity of Technical glyphosate[1] to aquatic organisms

Species	Concentration (ppm)	Effect	Source
Rainbow trout	140 (120-170) 38 86	96-hr LC_{50} 96-hr TL_{50} 96-hr LC_{50}	Folmar and others 1979 USDA 1981, cited in Sassman and others 1984 Monsanto 1985.
Bluegill	140 (110-160) 24 78 120	96-hr LC_{50} (static test) 96-hr LC_{50} (flow-through test) 96-hr TL_{50} 96-hr TL_{50}	Folmar and others 1979 USDA 1981, cited in Sassman and others 1984 Sassman and others 1984 Monsanto 1985b
Fathead minnow	97 (79-120) 25.7	96-hr LC_{50} MATC, no adverse effects on survival, growth, or reproduction during 255 days of exposure	Folmar and others 1979 Monsanto 1985
Channel catfish	130 (110-160)	96-hr LC_{50}	Folmar and others 1979[2]
Carp	115	96-hr LC_{50}	USDA 1981, cited in Sassman and others 1984
Water flea (*Daphnia* sp.) *D. magna*	 780 50	 48-hr LC_{50} NOEL, based on reduced reproduction at 96 ppm; 21 days of exposure	 Monsanto 1985 Monsanto (undated)
Midge	55	48-hr EC_{50}	Folmar and others 1979

[1]Assumed formulation: Technical grade (95% or more of active ingredient).
[2]Combined with X-77 surfactant.

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APPENDIX I – Proposed Forest Plan Amendment

Appendix I.

PROPOSED FOREST PLAN AMENDMENT

Under the Preferred Alternative (Alternative C), the Lolo National Forest Land and Resource Management Plan (1986) would be amended by adding:

- ☐ noxious weed control objectives;
- ☐ forest-wide and management area standards for reducing weed spread, and for weed control projects;
- ☐ monitoring items;
- ☐ and by adding a new appendix to the Plan giving guidelines for weed prevention in all management activities, and for weed control projects.

The proposed amendment begins on the next page. Since other Forest Plan amendments are pending at this writing, the final amendment will be numbered, dated, and reprinted in the Record of Decision.

LOLO NATIONAL FOREST

LAND AND RESOURCE MANAGEMENT PLAN

AMENDMENT NO. [ ]

[date]

This amendment adds noxious weed management objectives, standards, monitoring, and project guidelines developed in the ***Lolo National Forest Noxious Weed Management Environmental Impact Statement***, as outlined below:

- Forest-Wide Objectives
- Forest-Wide Standards
- Monitoring Items
- Weed Prevention and Control Guidelines (Appendix W)
    - Noxious Weed Definitions
    - Areas at Risk to Weeds
    - Weed Prevention Measures (for all management activities)
    - Control Objectives by Weed Species
    - Weed Control Project Mitigation
    - Seeding Guidelines

Forest-Wide Objectives.

Insert into page II-2, append to Forest-wide Management Direction, (B) Objectives, (1) Resource/Activity Summary:

All management activities will incorporate appropriate noxious weed prevention measures. Noxious weed control projects will be focused where they may have the greatest effect on preventing weed spread or damage to natural resources, and the greatest benefit to people who are actively trying to control weeds on land adjacent to the National Forest. Highest priority will be given to weed control projects in the following three situations:

- areas that are now relatively free of weeds, (including Wilderness, trailheads, and unroaded areas);
- new infestations and small weed patches that threaten areas at high or moderate ecological risk to weed invasion,
- weeds on National Forest System land next to or near other landownerships where land managers have active weed control programs.

Forest-Wide Standards.

Insert into page II-20 after (E) Standards, Roads (52)(o):

p. The need to prevent or retard noxious weed spread will be a consideration for the closure of certain roads.

After page II-20, insert:

Noxious Weeds:

59. Reduce the spread of noxious weeds into relatively weed-free areas by following the weed prevention measures given in Appendix W. Planning for all projects will include an assessment of current weed conditions on the site, and weed risk factors (as described in: *An Evaluation of Noxious Weeds on the Lolo, Bitterroot, and Flathead Forests*, B. John Losensky, 1987). Project alternative development and evaluation will consider weed risk and spread prevention factors.

60. Noxious weed control projects will follow the planning and implementation guidelines given in Appendix W.

61. To keep Wilderness and currently weed-free unroaded areas "clean," Forest Service administrative pastures will be treated to ensure that government packstock is grazed on weed-free feed so that stock is "quarantined" before entering the backcountry. Administrative sites, developed recreation sites, and pastures will be treated as demonstration areas to give people an easily accessible opportunity to view the results of sound weed management. Forest Service administrative activities and permittees will be required to use only certified weed-free feeds and straw bedding in unroaded areas and Wilderness. Other users will be encouraged or required to do the same. In established Wilderness, any weed-free feed or bedding requirements will be made as part of the Limits to Acceptable Change planning process for each individual Wilderness.

62. Roads may be constructed through important, relatively weed-free, bunchgrass winter range when effective measures to preclude weed establishment and spread from the road are included in project design and monitoring, and implemented in construction and maintenance. This standard applies to all actual winter range (inclusions as well as designated winter range management areas) where bunchgrass communities are a significant component of the understory.

Monitoring.

Insert the items on the following page into Table V.1, page V-11:

[*In the final amendment, Table C-1 from Appendix C of this FEIS will be printed here*].

Weed Prevention and Control Guidelines.

Add a new appendix to the Forest Plan:

APPENDIX W

Guidelines for Noxious Weed Prevention and Control.

Noxious Weed Definitions.

[*In the final amendment, the "Noxious Weed Definition" section from Chapter I of this FEIS (pages I-4 and I-5) will be printed here.*]

Areas at Risk to Weeds.

[*In the final amendment, the "Area at Risk to Weeds" section from Chapter III of this FEIS (pages III-6 through III-8) will be printed here.*]

Weed Prevention Measures.

[*In the final amendment, the "Weed Prevention Measures" section from Appendix D of this FEIS (pages D-1 through D-5) will be inserted here.*]

Weed Control Objectives.

Objectives Definitions.

The following definitions are taken from the ***Lolo National Forest Noxious Weed Management FEIS***:

ERADICATE	Attempt to totally eliminate a noxious weed species from Lolo National Forest lands, recognizing that this may not actually be achieved during the analysis period. However, eradication efforts would continue as long as detectable levels of the weed were present on the forest.
SUPPRESS	Prevent seed production throughout the target patch and reduce the area coverage of the weed. Prevent the weed species from dominating the vegetation of the area, but accept low levels of the weed.
CONTAIN	Prevent the spread of the weed beyond the perimeter of patches or infestation areas established as of 1988. **TOLERATE** weeds within established infestations, but **SUPPRESS** or **ERADICATE** outside those areas.
TOLERATE	Accept the continued presence of established infestations and the probable spread to ecological limits for certain species. Try to exclude new infestations through preventive practices.

These objectives are *targets* that give direction for the intensity of control actions. Often it will not be possible to achieve 100 percent of the target. Still, such a target can be useful. For instance, a target of eradication provides for intense and sustained efforts to totally eliminate a given weed. Although it may be unrealistic to actually expect that this goal could be attained over a large area, using this target allows for more intense control efforts than would a target of suppression. In the latter case, some level of residual weed population would be acceptable; under the former, control efforts would not cease as long as any of the weed persisted in the control area.

Species Control Objectives.

The following are general, forest-wide objectives. They should be used to guide control project development, but keep in mind that actual objectives for individual projects should be determined through site-specific analysis, and thus may differ from these objectives.

Prevent or **eradicate** any new invaders.

Eradicate musk thistle across the forest (limited acreage and effective control is available).

Eradicate tansy in new infestations and roadsides (where treatment is relatively easy and effective) – **Contain** established stands elsewhere.

Suppress diffuse knapweed, houndstongue, and dalmatian toadflax across the forest (limited acreage and control effectiveness is moderate).

Suppress spotted knapweed, goatweed, and new infestations of leafy spurge in Co-op areas and the Special Management Areas listed in Table III-2 – **Contain** elsewhere (action is concentrated on high impact areas because infestation acreages are extensive and available control effectiveness is moderate).

Contain Canada thistle in Co-op areas and Special Management Areas (Table III-2) – **Tolerate** while seeking long-term biological control elsewhere (low impact species that tends not to persist in the absence of ground disturbing activity).

Weed Control Project Mitigation.

[*In the final amendment, the "Weed Control Project Mitigation" section from Appendix D of this FEIS (pages D-6 through D-10) will be inserted here.*]

Seeding Guidelines.

[*In the final amendment, the "Seeding Guidelines" section from Appendix D of this FEIS (pages D-11 through D-15) will be inserted here.*]

☐☐☐ END OF AMENDMENT ☐☐☐

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